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TEXTILE
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AMERICAN DYESTUFF REPORTER

There are times . . .

in the lives of all of us, no matter how expert in our field, when we find we have lived too close to a problem to retain our perspective.

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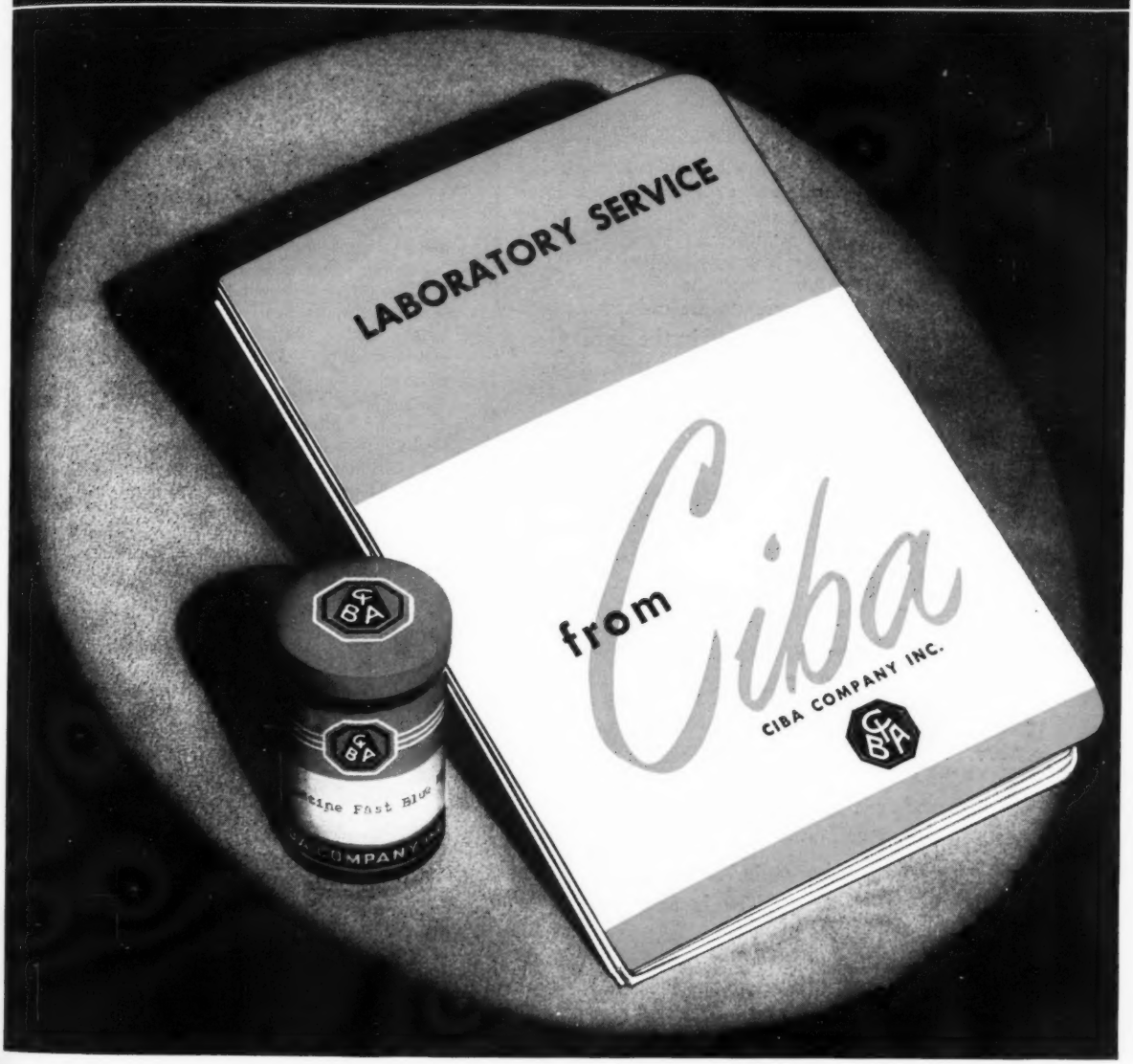

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Hooker CP-40, A New and Improved Chlorinated Paraffin

In formulations for flame and water repellency where 40% Chlorinated Paraffin may be used, here is a new and improved Hooker product. It is an exceptionally stable, light colored viscous liquid with an extremely low iron content.

Hooker specialized experience in chlorinating long chain aliphatics has resulted in the development of this improved product. CP-40 is compatible with a number of film forming resins, and may be used as a plasticizer or extender with them. Technical Data Sheet No. 731 which more completely describes CP-40 is available when requested on your company letterhead.

Physical Properties CP-40

Chlorine Content	42 ± 1%
Specific Gravity, 15.5°/15.5°C	1.185 ± .01
Viscosity at 210°F (Saybolt Universal)	160 to 180
Acidity as HCl	0.006% max.
Iron	10 ppm. max.
Color, Union Colorimeter ASTM	1.5 to 2.5
Thermal Stability (6 hours at 300°F)	0.15% HCl max.

Where the formulation calls for a 70% chlorinated paraffin, Hooker CP-70 is available for similar uses. This material is a brittle amber colored resin. It is crushed and shipped as a white powder which does not agglomerate on standing.

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BENZAMIDE

Benzamide (Amide of Benzoic Acid) is a white, free-flowing monoclinic crystalline material.
Its physical and chemical properties suggest its application in the fields of organic synthesis, including plastics, pharmaceuticals and dyestuffs. It is compatible with a limited number of resins including cellulose acetate and nitrocellulose with which it forms a firm transparent film.
For more complete information write on your letterhead for Technical Data Sheet No. 361 which lists the physical properties and a number of the reactions which Benzamide will undergo.

Because of its relative chemical inertness CP-70 is suggested also in formulations for fireproof paints, adhesives, linoleum, etc. In protective coatings and paints it does not adversely affect the rate of drying. Technical Data Sheet No. 763, describing more fully the properties of this chemical, is available when requested on your company letterhead.

Physical Properties CP-70

Analysis (typical)	
Chlorine	69 to 73%
Free HCl	0.05 max.
Iron	0.01 max.
Softening Range	90°to 100°C
Acid Number, mg. KOH/gm	0.50 max.

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An improved softening and finishing agent for use on all types of fabrics. It imparts an odorless finish which is resistant to washing and dry cleaning. Can be used as a substitute for sulphonated oils, tallows and other softeners. Its use eliminates yellowing and rancidity often encountered with the usual fatty type of softening agents.

PERMALENE SOL

A penetrant and cleanser designed for use on all fabrics especially those that are tightly woven and highly twisted. Recommended for pad-dyeing where it insures uniform and thorough penetration. It is of great assistance where low temperature dyeings are necessary. Non-foaming at high speeds, it is stable in neutral, alkaline and acid solutions.

REPCOLENE

This multi-purpose auxiliary is a neutral blend of fatty acid esters and aromatic sulphonates. It is a clear, free-flowing, non-jellying liquid. Effective wetting and scouring agent, it also acts as an excellent dye assistant and leveling agent. It is extremely stable and its activity is not affected by acids, alkalies, lime, or the salts usually found in hard water.

PERMALENE WS

A white powder soluble in water at 80° F. Capable of dispersing iron, calcium and magnesium salts and redissolving or redispersing precipitated compounds of these metals. It is so highly buffered that the pH of its solution is practically independent of its concentration.

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In a world that grows cleaner day by day, textile mills are depending more and more upon the chemical magic of Sulframin DT. For Sulframin DT is an unusually efficient detergent; and is very economical besides.

Chemically classified as an alkylaminosulphate, Sulframin DT functions effectively in almost every phase of boiling off and drying procedure. As an emulsifier and foaming agent it performs ideally; it dissolves readily and blossoms into rich suds even when diluted by ten thousand parts of water. Equally important, the efficiency of Sulframin DT isn't lessened when used in hard water.

Moreover, Sulframin DT is unaffected by the presence of lime and magnesium salts; it resists both acids and alkalies; and even after long storage, it does not deteriorate. Sulframin contains no soap; consequently rancidity and stains —so common when soap is used as the emulsifier —no longer present a textile problem. And in the dyeing industry concerned with processing rayons and acetates, the thorough dispersing qualities of Sulframin DT are utilized to particular advantage.

If you require more detailed information, phone or write!

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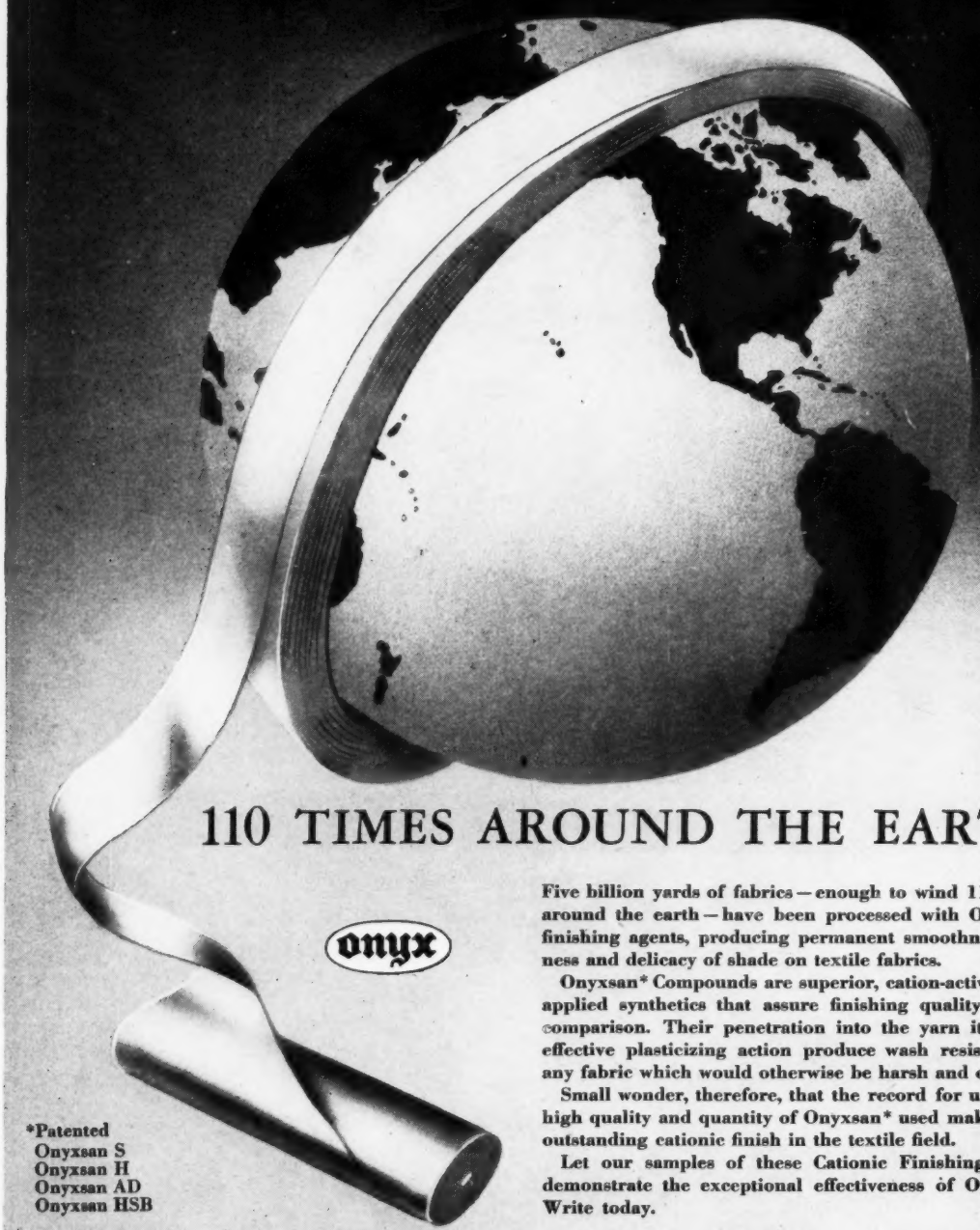

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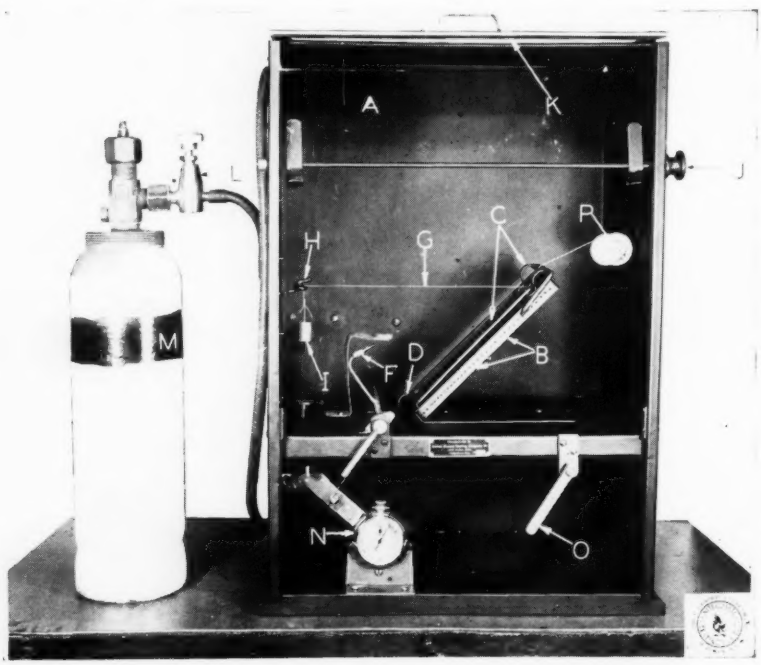

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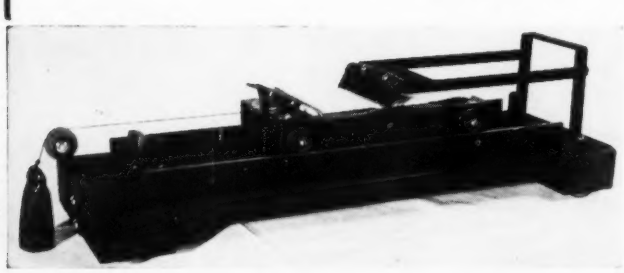

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AHCOWET* ANS

A GENERAL UTILITY SURFACE-ACTIVE COMPOUND

PENETRANT

DETERGENT

DYEING ASSISTANT

WETTING AGENT

AHCOWET ANS is truly a general utility chemical in the finishing department, having an exceptionally wide adaptability. It has excellent wetting out and penetrating properties, is an effective detergent, and is also used as a dyeing assistant. Other applications include kier boiling and sizing.

AHCOWET ANS is an amber colored liquid, readily soluble in water and equally effective in acid, alkaline and neutral solutions. It is highly efficient in hard water, concentrations of 350-400 ppm of calcium and magnesium salts having no effect. It is also stable to common and glauber salts at concentrations usually employed in dyebaths. It is *not* recommended for mercerizing, or where the concentration of caustic soda exceeds 2%.

STANDARD DRAVES WETTING TESTS

(Using a 3 Gram Weight with Unbleached Cotton Yarn)

	Sinking Time in Seconds		
	Water	2% Caustic Soda	2% Sulfuric Acid
0.3	8	9	10
0.5	3.5	4	4½
0.75	1.7	2¼	2¼

Sample on request

*Trade Mark Reg.

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ANOTHER DAN RIVER RESEARCH PROCESS

CONTINUOUS DYEING OF TEXTILE MATERIALS

United States Patent No. 2,396,908
(Also known as Continuous Pigment Vat Dyeing)
Issued March 19, 1946

To Glenn F. Womble, Assignor to Riverside & Dan River Cotton Mills, Inc., Danville, Va., a Corporation of Virginia

THE INVENTION AND ITS OBJECT

Owing to the fact that the U. S. Patent Office supply of copies of this patent paper are temporarily exhausted, we quote here, in part, from the text of the patent:

"This invention relates to the process of continuous dyeing of textile materials with vat dyestuffs.

"The object of the invention is to provide a rapid economical and continuous method of vat dyeing, obtaining results comparable in depth of shade, fastness properties and appearance, to the products of the old and well known pigment-pad method, a two step process commonly used in the practice of dyeing vat colors of medium and heavy shades.

"Dyeing with 'vat' dyestuffs is accomplished by reducing them chemically by a suitable reducing agent such as sodium hydrosulphite, to the leuco condition and dissolving them by means of a suitable alkali such as sodium hydroxide (commonly known as caustic soda). In this condition they are taken up by the affinity of the various fibers constituting the material, rinsed with water and subsequently oxidized by the oxygen of the air, or chemical oxidizing agents such as sodium perborate, sodium bichromate and acetic acid, hydrogen peroxide, and numerous others; rinsed again and usually soaped to remove any loose particles of dyestuff, to develop the shade, and increase the fastness properties and given a final rinsing with water to remove the soap.

THE RESULTS FROM THE INVENTION

1. "The ability to reduce (or dissolve) the dye simultaneously and continuously at rates of speed comparable to the usual methods for dyeing light shades.

2. "Production of medium and heavy shades having a smooth appearance free from the usual disagreeable heavy dyed neps and irregular surface deposits which are usually present as a result of trying to dye same shades by the usual reduced pad continuous dyeing methods. This process is especially adapted to the use on heavy and closely woven goods such as 'Windbreaker' poplins and heavy twills of the types used for army wear, allowing unusual speeds of one hundred yards or more per minute.

3. "Ability to obtain fastness properties comparable to the slow and expensive pad-jig dyed fabrics."

APPLICATION OF THE INVENTION

Textile materials to which this invention is applicable are defined in the patent papers as follows:

"Throughout this application all the processes are described as applied to conventional piece goods of standard width. However, this invention is applicable to narrow width goods and also single yarns and cords. Therefore, the word 'fabric' or 'textile' as used in this application is defined as including not only wide and narrow fabrics, but also single yarns and cords."

CLAIMS OF THE INVENTOR

Six claims are set forth in the patent papers of which the following claim, No. 2, is cited by way of example:

2. "Those steps in the method of solid color dyeing of one continuous piece of textile material in one operation with vat dyestuffs, which comprise applying to the textile a fluid, unthickened, water dispersion of pigment, squeezing and drying by heating to remove a substantial portion of the water from the textile during movement of the textile without disturbing the pigment on the textile, immediately subjecting the dried and heated textile for a relatively short period of time to an alkaline reducing bath maintained at substantially constant and relatively high concentration, and then subjecting the continuous length of textile to a squeezing action after such reducing bath to obtain thorough penetration of said reducing agent and contact with the pigments in the heated fabric."

STATUS OF THE INVENTION DURING THE WAR PERIOD

The owners of this patent, Riverside & Dan River Cotton Mills, Inc., realizing that this process was essential to the production of Army goods during the war period and that restrictions on its use generally by the industry would tend to bring about a critical shortage of Army goods of the required deep shades, made no effort to maintain its exclusive rights to this process during the period of hostilities, and for six months after the cessation of hostilities.

This was in full conformity with the spirit and the letter of a contract entered into by Riverside & Dan River Cotton Mills, Inc. with the United States Government, whereby patent owners "to further the prosecution of the war, aid in national defense and promote the common welfare," granted "releases and royalty-free licenses to the Government to practice the inventions secured by their patents and applications for patents."

By its terms this contract terminated "on the date six months after the cessation of hostilities in all wars in which the United States is now engaged." Accordingly this contract with the Government expired as of March 2, 1946.

LICENSING AGREEMENTS

Upon expiration of this contract, Riverside & Dan River Cotton Mills, Inc. proceeded forthwith to make available to the industry Licensing Agreements under the terms of which Licensees will be enabled to enjoy all the benefits of this invention equally with Riverside & Dan River Cotton Mills, Inc., owner of the patent covering this exclusive process.

Information as to these licensing agreements may be obtained from

Research Engineering Division

RIVERSIDE & DAN RIVER COTTON MILLS, INC.

DANVILLE, VIRGINIA

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USE THIS KARBATE BRAND BAYONET HEATER

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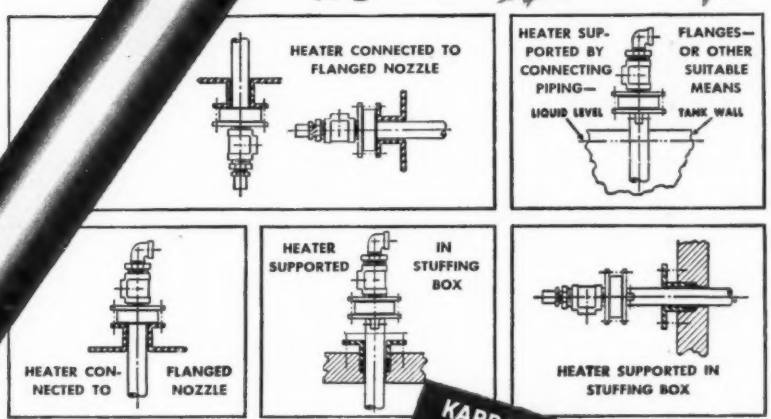
Made of "Karbate" impervious graphite, this heater is chemically inert, as well as resistant to thermal and mechanical shock. It will not rust or corrode. And "Karbate" impervious graphite provides higher rates of heat transfer than most commonly-used materials.

This highly adaptable heater is light in weight, simple to install. It is now in stock in various standard sizes—ready for immediate delivery. Order now and keep handy for any number of applications around the plant.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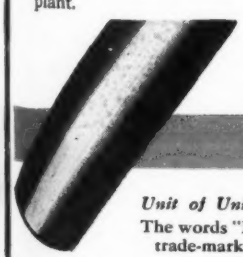

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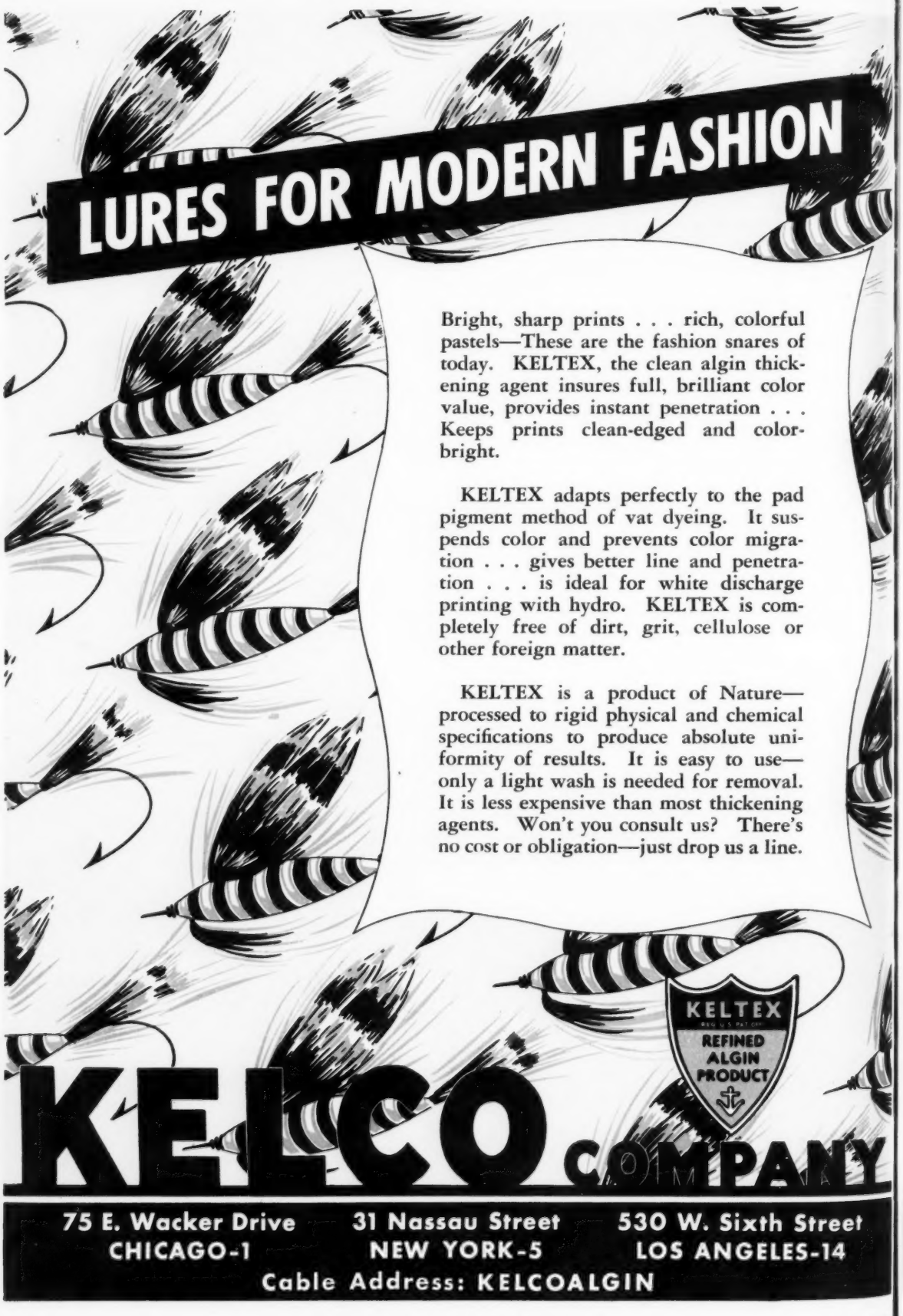
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Through painstaking research and formulation, Eastman laboratories have produced an extensive line of dyestuffs for use with cellulose acetate rayon fibers, fabrics, and blends.

For information on Eastman Acetate Dyestuffs and their application to synthetic fibers, write to the TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

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There is a C.P.P. soap or synthetic detergent for every type of fabric—for every processing problem. Ask your local Colgate-Palmolive-Peet representative for detailed information on the full line of C.P.P. processing agents made for the textile industry. Or, write to Industrial Department, Colgate-Palmolive-Peet Co.

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To help increase "Take-Home Savings"

THE Treasury Department has published two new booklets to help you and your employees realize the utmost benefit from your Payroll Savings Plan—benefits proportioned to the extent your employees add to "take home savings" by buying and holding U. S. Savings Bonds.

"Peacetime Payroll Savings Plan" for key executives offers helpful suggestions on the conduct of the Payroll Savings Plan. In addition, it quotes leaders of Industry and Labor and their reasons for supporting the Plan.

"This Time It's For You" is for distribution to employees. It explains graphically how this convenient, easy thrift habit works. It suggest goals to save for and how much to set aside regularly in order to attain their objectives. If you have not received these two booklets, or desire additional quantities, communicate with your State Director of the Treasury Department's Savings Bond Division.

See your Payroll Savings Plan through to maintain your share in America's future. It is sound economics and a powerful force for good today—and tomorrow—as a safeguard for stability and a reserve of future purchasing power—money that is kept within your community.

The Treasury Department acknowledges with appreciation the publication of this message by

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June 3, 194

NO SURFACE PEEL

Stainless steel forms reduce snagging of fabrics

The smoothness of these stainless steel drying forms protects women's stockings from snags. Stainless steel has no surface plating to chip, peel, or rust. Thus, even during the "stripping" operation, shown here, the delicate fibers are not endangered because there are no rough surfaces.

Stainless steel is used extensively throughout the textile industry. Its usefulness has long been recognized, especially in dyeing operations, where its high resistance to corrosion and ease of cleaning are of particular advantage.

To keep informed of the newer uses of stainless and other alloy steels, ask to receive our monthly publication ELECTROMET REVIEW. If you wish information on the production, properties, or fabrication of these steels, write our Technical Service Department. Although we do not make steel, we do produce the ferro-alloys which are used in its manufacture, and our engineers have accumulated a fund of information on the use of stainless steel in many industries.

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STAINLESS STEEL

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BEST COMBINATION OF THESE QUALITIES

The FACTS Behind the Glycerine Shortage

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This is the reason why enough glycerine cannot be produced at present to supply immediately all the heavy demands of the reconversion period.

Just as bread is short because of the world-wide shortage of wheat so, temporarily, the full demand for glycerine cannot be supplied because of the shortage of fats and oils.

As this situation gradually corrects itself, glycerine will be in good supply again and fully at your service.

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"...with Resloom....., felting and consequent high shrinkage normally experienced with wool will not take place"*

Laundry Age, January, 1946

Mr. Arthur I. Anderson, who conducted Resloom tests, examines a wool shirt after laundering. Mr. Anderson heads the New England Testing Laboratory, Somerville, Mass.; was formerly head of the American Institute of Laundering's Department of Washroom Research and Textiles.

This statement by Arthur I. Anderson in "Laundry Age" confirms again what Monsanto textile chemists have been saying about that extraordinary melamine finish, Resloom: TRULY LAUNDERABLE WOOLENS ARE NOW POSSIBLE.

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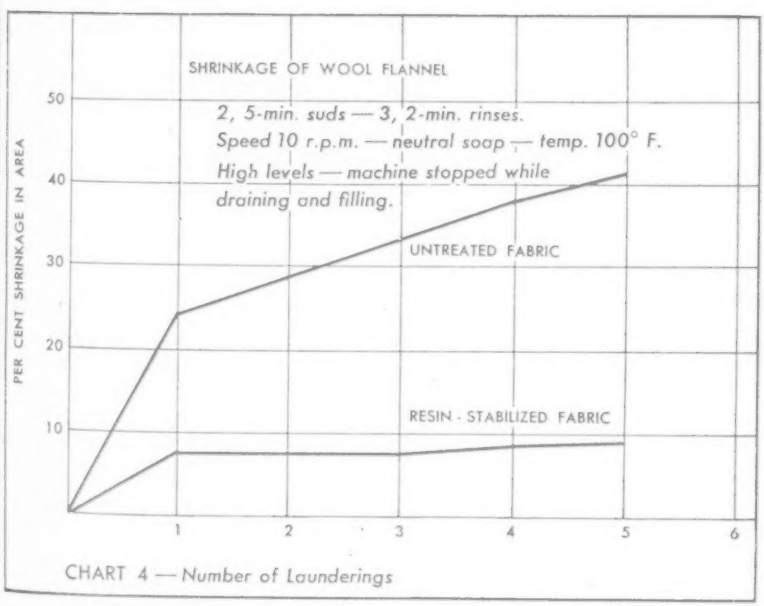

CHART 4 — *Number of Launderings*

*Full text of quotation:

"Numerous laundering tests conducted with wool fabrics resin-stabilized with Resloom reveal that even at high machine speeds and/or in high-temperature washing, felting and consequent high shrinkage normally experienced with wool will not take place. In fact, such fabrics when commercially available could be washed without use of numerous precautions now necessary. In addition to special equipment that would not be needed, it is apparent that more wool apparel would fall into the classification of 'launderable'."

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Contents

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

• Special Articles

The Action of Antiperspirant Creams on Fabrics... 269
Ruth R. Bien

The Army's Water Repellent Clothing (Concluded). 272
J. E. Simpson

Evaluation and Comparison of Two Commercial Bleaching Processes 285
James H. Kettering and Rita M. Kraemer

• Departments

Trade Notes—New Products 291

• Proceedings of the American Association of Textile Chemists and Colorists

Mildew and Rot Resistance of Textiles and Effectiveness of Textile Fungicides..... P274

Plastics—

Unsupported Films and Sheetings..... P277
C. W. Patton

Plastic Monofilaments P279
M. R. Radcliffe

Some Pitfalls in Accelerated Testing..... P280
R. E. Thomas

Meeting, Southeastern Section P282

Meeting, New York Section..... P282

Meetings, Rhode Island Section..... P283

Membership Applications P283

Calendar of Coming Events..... P284

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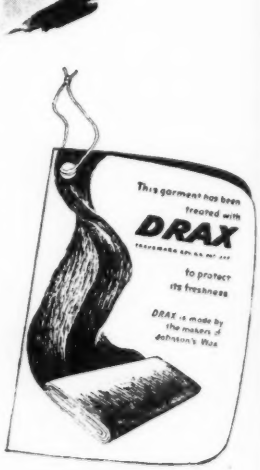

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AMERICAN
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VOLUME 35 JUNE 3, 1946 NUMBER 11

The Action of ANTIPERSPIRANT CREAMS on Fabrics*

RUTH R. BIEN, B.S.
Good Housekeeping Bureau

THE investigation of antiperspirant creams has been a problem—and no small one—for this laboratory during the last 10 years. Our work has been guided by primary emphasis on two factors—the effectiveness of a cream in safely controlling perspiration, and its safety in contact with textiles.

Elaborate research has been conducted by other laboratories on the effectiveness angle to achieve a quantitative measure of the retarding action of various products under controlled laboratory conditions. We have conducted no investigations of this kind. What we have wanted to know, is, quite simply—"Will this product give adequate protection under conditions of *everyday activity*—to the stenographer at her desk or the housewife in her kitchen?" This phase of the subject is, however, primarily the province of the Beauty Editor's practical use laboratory. This paper will be concerned almost entirely with the action of these creams on textiles.

THE PROBLEM

When it became evident to us that fabric damage from contact with low pH creams was likely to occur, we conducted a long series of investigations to provide answers to a number of basic questions:

1. Are all types of textiles vulnerable to the action of these creams?
2. What are the conditions which will produce maximum damage?
3. Can laboratory results constitute a prediction of results in actual use?

Our reasons for wishing to establish a laboratory procedure, by the way, were two-fold—the considerable saving in time which would be effected, and our reluctance to ask the necessary group of human guinea pigs to use a product which might be potentially destructive.

To answer these questions, a number of creams were applied in varying amounts to cotton, linen, viscose rayon, acetate rayon, silk and wool, and were maintained under different conditions of time, temperature and humidity. The effect of ironing the treated materials with and without preliminary laundering was also studied. Briefly, our conclusions from these preliminary studies were:—

1. Silk, wool and acetate rayon are highly resistant under all practical conditions.
2. Linen, cotton and viscose rayon are extremely vulnerable.
3. Maximum damage is produced by ironing without preliminary laundering. Creams which contain no buffering ingredient will usually cause complete destruction of cotton, linen and viscose rayon when so treated.

PRACTICAL USE STUDIES

The Beauty Editor's practical use studies, which ran parallel to the laboratory work, pointed up a practical projection of these results. Many women will subject garments—summer cottons and linens and blouses in particular—to pressing between launderings or dry cleanings. The application of heat, therefore, to fabric impregnated with these acid creams would provide a set of conditions similar to the pressing of unlaundered garments to which antiperspirant had adhered. Admittedly, this direct application of cream to fabrics, followed by ironing without laundering, is fairly severe treatment. We therefore elaborated our correlation of laboratory and wear test results until we had a set of laboratory conditions which could be accurately projected to predict actual use results. Early in the course of our work, cotton was adopted as the test fabric, because it was extremely susceptible to damage and because it was, at that time, available in sufficiently uniform quality. The laboratory conditions which were finally adopted (see Appendix A for details) involved the application of a uniform amount of cream to a one inch area down the center of a strip 21 x 6 inches, incubation of the treated material at high humidity and slightly elevated temperature, followed by ironing for 10 seconds in a flat bed electric ironer set for a temperature range of 275-295° F. The tensile strength of the treated material was then determined against controls to which no cream had been applied, but which had otherwise been similarly treated. At least 5 strips, representing 25 individual breaks are used for each product under investigation.

Antiperspirant creams which caused a reduction in tensile strength of less than 20 per cent under the above conditions were found to cause negligible damage in use. It was necessary, of course, to devise a method of estimating damage in use in order to correlate the results of our laboratory investigations, and also as a final

TABLE 1
Effect of Ironing Without Laundering

	% loss in Tensile Strength after 24 hours incubation at 80° F. and 85%	Relative Humidity
Cream A—buffered	no loss	1.78
Cream B—partially buffered	no loss	62.24
Cream C—not buffered (contained aluminum chloride)	35.69	85.84

* Reprinted from Proceedings of the Scientific Section of The Toilet Goods Association, Number 4, Dec. 6, 1945.

TABLE 2
Effect of Prolonged Incubation (1 Week) at 80° F. and 85% R.H. Without Ironing

	% loss in Tensile Strength
Cream A—buffered	no loss
Cream B—buffered—"bleeding" type	no loss
Cream C—not buffered (contained aluminum sulfate)	no loss

check in doubtful cases. This procedure (see Appendix B for details) involves the pinning of shields made from the cotton test fabric into the dresses of our groups of human guinea pigs during a three day period in which the antiperspirant cream under investigation is applied each morning by an expert operator. These shields are worn during the business day, are removed at night and replaced each morning. At the end of the three day period these shields are ironed at the usual temperature for cotton—375°F.—and any reduction in tensile strength measured against unworn controls.

EFFECT OF BUFFERS

The establishment of these two methods represents many months of work and the destruction of untold yards of material—fortunately at a time when there was plenty to destroy. For a number of years thereafter we had pretty plain sailing. The products which we handled at that time fell pretty sharply into two categories, those which contained a buffering ingredient and those which did not. The former gave uniformly satisfactory results from the standpoint of fabric destruction—the latter often obliged us by disintegrating completely when they were ironed, thereby sparing us the tedious job of breaking the strips. In the last few years, however, the picture has been a very different one. There are, I think, three major reasons for the difficulties which we have encountered since early in 1942.

1. Raw material shortages due to the war.
2. A rapidly growing market for antiperspirant creams, resulting, of course, in the launching of many new products.
3. The desire of manufacturers to present an improved product in the face of increased competition.

One of the greatest bugbears with which manufacturers of these creams have had to contend is their marked tendency to dry out in the jar—a tendency which was accentuated in many instances by war-induced changes in jar closures. The addition to a formula of some humectant material seems a logical and simple method of correcting this fault, but therein, I am afraid, hangs a tale. In any case, at about this time, creams began to appear on the market which exhibited a peculiar phenomenon when subjected to the incubation at high humidity called for in the laboratory procedure. By the end of the 24-hour incubation period, a breakdown in the emulsion had occurred, resulting in a "bleed" of watery exudate on either side of the center area to which the cream had been applied. This "bleed" is often irregular, so that a single strip may contain areas where no break in the emulsion seems to have occurred, and others where it has. The picture of tensile strength reduction presented by those "bleeding" creams is a peculiar one. Low breaks, indicating bad damage, occurred *outside* of the treated area, at points where the watery exudate has saturated the fabric. The breaks are often very irregular, the extent of the damage seeming to depend on the extent of the separation. In these instances of irregular "bleeding" it is not unusual to have percentages of destruction ranging from a low of 10-15 per cent to a high of 100 per cent on a single strip.

The first question which had to be answered in view of this new problem, was, of course, "Will these creams behave similarly in actual use?" A series of wear tests resulted in an emphatic "Yes."

Because it's our business to try to find the reason why, and because we are always anxious to give all possible help to manufacturers, we have studied this problem fairly exhaustively, and the end is not yet. In fact, I am inclined to suspect that, basically, it is just beginning.

"BLEEDING" CREAMS

One of the more puzzling aspects of the behavior of the "bleeding" creams was why, even if a separation occurred, fabric damage should be so increased, since most of the buffering agents in general use are easily water-soluble and should, theoretically, travel with the water phase of the emulsion. We have, therefore, made an attempt to determine just what does happen. A carefully weighed amount of a cream which we know to be a bad "bleeder" and on which we had complete analytical data was applied to strips of cotton in the usual manner. These were then incubated as usual to allow the separation to occur. The one inch area to which the cream had been applied was then cut out of each strip. Buffering agent, sulfate and aluminum were determined both on the center strip and on the outside pieces where the watery exudate had penetrated. The results were quite interesting. Only one-third of the buffering agent had traveled with the water phase into the outside area. The other two-thirds was held with the base material on the center strip. On the other hand, two-thirds of the total sulfate present was found in the outside areas, and *no* aluminum, beyond an insignificant trace was recoverable from that portion. This seems to offer an explanation of the sharp rise in fabric damage, and why it occurs in the "bled" area. Not only is an insufficient level of buffer present, but the sulfate is there, presumably, as free sulfuric acid. I should like to emphasize that the foregoing is the result of work on only one product, and we are by no means ready to draw final conclusions from it. It is our plan to extend this work not only to other products, but to an effort to discover more of the whys and wherefores of the behavior of acid emulsions on fabric and on the skin.

IRONING TIME AND TEMPERATURE

Early in our experience with the unstable type of cream, and also with another type, which did not "bleed," but which still produced 30 to 50 per cent damage, it became evident that in these cases the ironing time and temperature became extremely critical. A non-separating cream, properly formulated and buffered, will stand an increase in the ironing temperature of 15-20° F. without marked increase in the amount of damage produced. Similarly, a completely unbuffered cream will produce marked damage 15-20° F. below 275° F. The two special cases referred to above, however, may give a seemingly satisfactory result if the temperature regulation is at all off on the low side, and the extent of damage increases markedly with any rise above the usual range. This has presented difficulties in cooperative work with other laboratories, and for this reason we have lately been attempting a modification of our standard method, substituting a hot air oven for the ironing process.

MODIFICATION OF STANDARD METHOD

In our first set of experiments the oven

TABLE 3
Dinspersion of Ingredients in a "Bleeding" Cream Incubated 24 Hours at 80° F. and 85% R.H.

	Buffer	*Sulfate*	*Aluminum*
Total present	12.07%	6.87%	1.16%
Recovered from center strip	6.97%	2.08%	trace*
Recovered from outside areas	4.37%	4.65%	trace*
Total recovered	11.34%	6.73%	trace*

* Aluminum evidently attached to acid-insoluble fraction.

was set so that the temperature during exposure was at the mean range of the ironing temperature—285° F. Sets of treated strips were exposed for periods beginning at 5 seconds and ending at 120 seconds. This work was done on a product which had been subjected to the regular procedure, and our purpose, of course, was to establish a time of exposure in the oven which would produce the same amount of damage as was incurred by the ironing. Our results suggested that 100 seconds exposure in the oven produced approximately the same level of damage as did the ironing. (See Table 4). This investigation will have to be extended to a much larger group of products before any definite conclusion can be reached. One very interesting thing is suggested to me though, by this preliminary study, the critical importance of time as well as temperature of exposure. This would account partially at least for variation in the results of different operators, even when all other factors have been duplicated and controlled as completely as possible. Such variations might be due not only to the accuracy with which the individual operator timed her exposures, but also to the speed at which she worked, since the unavoidable temperature fluctuation of an electric ironer is, of course, affected by the time intervals between opening and closing.

TABLE 4

Loss in Tensile Strength Using Hot Air Oven at 150° C. as Source of Heat—Cream D

Loss by standard ironing procedure—52.57 per cent

Oven Exposures	
5 seconds	2.22%
10 seconds	5.36%
20 seconds	8.39%
40 seconds	10.02%
80 seconds	29.85%
100 seconds	49.89%
120 seconds	68.97%
140 seconds	71.73%

A second series of oven exposures, suggested by discussions with another laboratory with which we have been doing cooperative work, was undertaken to explore the possibilities of longer exposure at a lower temperature. In this series, the oven was set at 105° C. and a pan of water was placed in it in an attempt to prevent undue drying out of the strips during the longer exposure. Four creams were used—which had showed the following levels of damage by the ironing procedure—

A—Non-bleeding—12%
B—Non-bleeding—37%
C—Bleeding—60%
D—Non-bleeding—50%

The times of exposure were 15 minutes, 30 minutes, 45 minutes, 1 hour, 1½ hours, and 2 hours. Exposure up to one hour resulted in negligible damage by all four. Cream A was still showing damage under 20 per cent at the end of 2 hours. The other three showed significant damage at both 1½ and 2 hours, but the results did not correlate too well with the ironing procedure. (See Table 5).

TABLE 5

Comparative Losses in Tensile Strength by Standard Ironing Procedure, and Exposure in a Hot Air Oven at 105° C.

	Standard Procedure	*Oven 15 min.*	*Oven 30 min.*	*Oven 45 min.*	*Oven 1 hour*	*Oven 1½ hours*	*Oven 2 hours*
Cream A—non-bleeding	12.32%	no loss	no loss	no loss	no loss	2.93%	19.60%
Cream B—non-bleeding	36.59%	no loss	no loss	no loss	5.32%	53.67%	73.08%
Cream C—"bleeding"	64.00%	no loss	no loss	no loss	5.88%	32.46%	42.80%
Cream D—non-bleeding	52.57%	no loss	no loss	no loss	3.73%	44.69%	48.83%

I have taken the time to discuss these incomplete studies for several reasons, First, they have been sufficiently interesting so that we will continue with them. Second, I believe they emphasize the undeniable fact that the problem with which we have to deal is far from a simple one. It is certainly no news to those of you who are concerned with the formulation and manufacture of acid emulsions that they are, to put it mildly, temperamental. I think it possible, however, that the importance of every single ingredient in an antiperspirant cream formula may not be fully appreciated. The composition of the base material is fully as important as the proper balance of aluminum salt and buffer. To change any single ingredient, or its concentration, in a satisfactory formula, is to risk increasing the fabric destruction potential from a safe to a dangerous level.

All of this comes back to the need for a real job of basic research—a job in which Good Housekeeping's laboratory is eager to cooperate to the fullest extent of its capacity, but one in which I hope I have showed you the participation of manufacturers not only of the finished product but of all the many possible components thereof is absolutely essential.

Appendix A

LABORATORY METHOD FOR DETERMINING POSSIBLE FABRIC DESTRUCTION BY CREAM-TYPE ANTI-PERSPIRANTS

1. Cotton percale is used for the purposes of this test. All material is to be washed and pressed before using. This is to be done in an ordinary washing machine using a ¼ per cent solution of Lux or other mild soap at 130° F. at the start, for 15 minutes, with 2 rinsings. Pressing, after drying, to be done in an ironer with the thermostats set at 275° F.
2. From the washed and pressed materials, strips 6 inches wide and 21 inches long (or longer if desired) are to be cut across the goods, after removing a 1 inch selvage strip. A 1 inch area is to be marked off down the center of the length of these strips for the application of the antiperspirant.
3. At least 5 such 6″ x 21″ strips shall be used for each test—giving at least 25 breaks in each case.
4. The cream shall be applied as evenly as possible and with the minimum of rubbing to the marked area of each strip in the proportion of approximately 2.5 gm. per 21 square inches.
5. The strips shall be suspended in an enclosure in which the temperature is 80° F and the relative humidity is 85 per cent for 24 hours.
6. A set of controls (at least 5 strips 6″ x 21″) to which no cream is applied shall be started on each day that tests on creams are begun. They shall be treated in every respect as the test pieces.
7. At the end of 24 hours ageing, the strips shall be pressed for 10 seconds in an electric ironer (preferably a flat-plate type) with the thermostats set so that the temperature range shall be between 275°-295° F. Sufficient time before beginning the pressing shall be allowed for the ironer to warm up and reach a steady state. The strips are to be laid, cream-side down on strips of paper toweling placed on the pad. The shoe shall come in direct contact with the back of each strip. The strips shall be pressed in rotation as rapidly as possible—e.g. control strip #1. Sample A strip #1, Sample B strip #1, etc. Note: The electric ironer should be previously tested and adjusted as far as possible for uniformity of temperature throughout the shoe. The period of temperature cycle (±10° F.) in such ironers is usually at least 10 minutes. By pressing the strips in rotation as described, it is believed that this unavoidable varia-

(*Continued on Page* 290)

THE ARMY'S WATER REPELLENT CLOTHING

DR. J. E. SIMPSON

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(Concluded from May 20, 1946, Issue)

PRESENT STATUS OF THE ARMY'S WATER-REPELLENT GARMENTS

A. Finishes

Unfortunately, in the past too much emphasis was placed on initial values for repellency. The Quartermaster Corps has changed its conception concerning this point during the past three years and now recognizes that the real merit of repellent finishes is their durability to wear and cleaning. Little emphasis is now placed on initial repellency; the real requirement is the performance level desired during the life of the garment.

The Quartermaster Corps has never had requirements governing the composition of durable water-repellent finishes. At the beginning of the war the specification requirement "Zelan or equal" was interpreted as a level of performance rather than as a chemical formula. On the other hand, until the fall of 1943, the pellents available in 1942, applicable after re-treating types of repellents had definite limitations as to composition. The Quarlaundering or dry-cleaning, were nontermaster Corps recognized that the first step toward getting better finishes was to remove these limitations if possible and to base the requirements entirely on performance tests known to measure the desired characteristics without reference to tradename products. The scope of developing such suitable test methods was so broad it was necessary to leave product development entirely to industry. Industry was given all possible assistance through constructive suggestions based upon laboratory results correlated with field performance. By this procedure industry has made definite improvements in water repellent products and finishes. There is no doubt that the repellents approved for Army use, both durable and re-treating, are greatly superior to those on the civilian market prior to the war. The presently approved durable finishes will retain between 50 per cent and 70 per cent of their original value, as mesaured by the accepted methods, when the fabric has begun to fray as a result of wear alone or wear plus several launderings.

Wet mechanical action occurring during wear or machine laundering is the dominating factor responsible for degradation of repellent finishes. A standard procedure has been developed for artificially inducing wet mechanical action which reduces the fabric and finish to a condition equivalent to approximately half of of the life expectancy of a fabric. The Army considers the durability of a finish to this procedure to be by far the most significant criterion for determining the suitability of a finish. Specifications have been written requiring considerable increase in durability to this degradation treatment.

Durability to drycleaning has been only a minor field requirement. Specification requirements have not been increased for dry-cleaning resistance although, of course, this would be desirable. This policy has been adhered to because it was believed impossible to develop finishes which could meet increased requirements for resistance to both laundering and dry cleaning in time to be useful during the war. At present, commercial drycleaning usually nullifies the original repellency due to the traces of rewettable dry-cleaning soaps and spotting materials left in the fabric.

The Quartermaster Corps now believes that the usefulness and durability of a water-repellent finish for cotton fabrics can be adequately measured and predicted by applying the finish to standard reference fabric (such as the 5-ounce poplin) and determining the following values for the treated fabric (a) initially, (b) after laundering-wet-mechanical action, and (c) after dry cleaning with solvent only:

(1) Dynamic water-absorption curve
(2) Drop-penetration time
(3) Hydrostatic pressure
(4) Surface spray
(5) Air permeability

These treatments and tests are now specified in Supplement No. 1 of the present Federal Specification CCC-T-191a *Test Methods for Textiles.* The actual numerical values obtained in these tests are given in each respective fabric specification, as some of the determinations are governed by both finish and fabric. Quartermaster Corps specifications require the testing of five specimens of each sample for each requirement. Not only must the arithmetical average of these five specimens meet certain minimum values, but specific limitations are also designated for the poorest specimen in the lot of five. This has been found to be an effective method for requiring consistency of quality in all production lots. A list of specifications for Quartermaster Corps fabrics requiring a durable water-repellent finish is given in the Appendix.

The emulsion-and solvent-types of repellents available in 1942, applicable after laundering or dry-cleaning, were nondurable to subsequent cleaning. Although it was never a specification requirement, the Quartermaster Corps tried to obtain re-treating products which would be durable to one or two cleaning cycles, or at least would be more durable to wear between servicings. Compositions have been modified to include zirconium salts, mixtures of waxes rather than a single kind, and resins which serve as both a repellent and a binder for the waxes. It is believed that this trend of development makes the term "non-durable" obsolescent, and for some time the Quartermaster Corps has given the designation "re-treating repellents" to the products used for treating finished garments. Re-treating repellents which are acceptable under the present specifications have been shown to give good repellency for two or three weeks of hard wear. Although meritorious products, they are not the equivalent of the approved durable finishes under comparable wear or comparable length of service between cleanings.

The Quartermaster Corps requires both aqueous- and solvent-type products to give satisfactory values:

(a) Initially
(b) After 2 hours' wet mechanical action
(c) After weathering

When tested for:

(1) Dynamic water absorption
(2) Hydrostatic pressure
(3) Surface spray, and
(4) Air permeability

These tests are made on standard poplin specimens. The products must also pass certain stability requirements.

The durable and re-treating repellents which are at present approved for Army use have been applied to wool fabrics. Some of the treated wool specimens have seemed quite resistant to wetting or water

(Continued on Page 288)

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MILDEW AND ROT RESISTANCE

of Textiles and Effectiveness of

TEXTILE FUNGICIDES

Tentative Method (3rd Revision–April 4, 1946)

This report was presented at the meeting of the Research Committee on April 4th and approved at that time as a tentative method. The report of this method is the result of two years' work on the part of Dr. H. D. Barker and his committee. We shall be pleased to receive any comments or suggestions in regard to this method.

PURPOSE AND SCOPE

The general purposes of these methods are two, namely (1) to determine the behavior of textiles with respect to mildew and (2) to evaluate mildew preventives offered to the textile trade.

Section I contains a description of the actual test procedures and includes only those which are thought to be most reproducible and widely applicable. In special cases it may be found desirable to depart in certain particulars from these procedures or to use tests other than those here described for articles with unusual service requirements.

Section II presents suggested methods of application and interpretation of these procedures in testing both the initial mildew resistance of textiles and the permanence of such resistance. In general it is intended that the choice of tests employed shall reflect the end use and conditions under which the fabric is to serve. Soil contact tests, for example, are intended to be used primarily for fabrics to withstand soil contact in service, weathering tests for fabrics to be exposed to the weather in use, etc.

Section III describes the application of these tests in determining the fungicidal potency of mildew preventive compounds under uniform conditions and in determining their permanence when applied to a standard fabric. In any particular instance with a commercially treated fabric, the behavior of a mildew preventive may be moderately or even greatly influenced by differences in weight and texture of the fabric, presence of dyes, water repellents or coating compositions, or by other factors not brought out in the tests described in Section III. Results of these tests will therefore need to be interpreted with such considerations in mind.

Section I
Specified Test Procedures

A. SAMPLES

Samples for the biological tests and for water leaching shall be prepared by cutting fabric 6" x 1½" with the long dimension parallel to the warp and ravelling to exactly 1 inch in width, or, in the case of fabric with less than 20 threads per inch, to a predetermined number of threads to give a sample approximately 1" in width. Samples for weathering shall be cut 18" x 6" with the long dimension parallel to the filling, and subsequently subsampled to give similar one-inch ravelled strips. Following the various tests, breaking strength determinations are to be made on the ravelled strips according to the method described under Federal Specification CCC-T-191a, ravelled strip method. At lease five replicate strips are to be used for each determination. A 15% tolerance for experimental error and variability in original strength is permitted, and losses greater than 15% shall be considered necessary to establish the significance of a change in strength. In the case of culture tests, visible growth must be present in addition to a significant strength loss, or the test repeated. In some cases leaching, sterilization or other nonbiological hazard encountered in connection with biological tests may influence the breaking strength of the fabric; in such cases the breaking strength loss shall be calculated so as to reflect only the loss due to the action of the test organism.

(Certain laboratories have found it a saving of time to use a steel die to cut 1" x 6" samples, thus eliminating the necessity for ravelling.)

B. BIOLOGICAL TESTS

1. Chaetomium globosum—mineral salts agar test

Organism: Chaetomium globosum ATCC 6205 (identical with Chaetomium globosum USDA 1042.4). *Note:* Cultures may be purchased from the American Type Culture Collection, Georgetown University School of Medicine, 3900 Reservoir Road, N. W., Washington 7, D. C.

Culture medium: The culture medium shall have the following composition:

NH_4NO_3	3.0 gms.
KH_2PO_4	2.5 gms.
K_2HPO_4	2.0 gms.
$MgSO_4$-7 H_2O	2.0 gms.
Agar	20.0 gms.
Distilled water	to 1,000 ml.

Inoculum: Sterilize about 40 ml of the above agar medium in each of the desired number of 250-ml Erlenmeyer flasks, and after the agar has hardened, under aseptic conditions, place on its surface in each flask one disc of filter paper, previously sterilized by dry heat in an oven at about 160° F. for 1 hour. The filter paper is streaked with spores of Chaetomium globosum by use of a sterile needle. After 10 days' incubation at 30° C., the culture should be in ripe fruiting condition. Prepare the spore suspension for inoculation by adding to the fruiting culture 50 ml of sterile distilled water containing a few glass beads and shake vigorously to bring the spores into suspension.

Culture chamber, inoculation, and incubation: Mineral-salts agar of the composition specified above, is melted in an autoclave and distributed into 16-oz. modified screw-top bottles 2½" square by about 6" high. The modified screw cap shall be prepared by cutting a circle approximately 1 cm in diameter from the center of both the cap and cap liner. A round piece of glass cloth (such as Owens-Corning Fiberglas CS-30A-20) the diameter of the cap liner shall be inserted between the cap and the ring of the liner. About 35-40 ml of medium shall be added to each bottle. The bottles shall then be sterilized at 15 lbs. steam pressure, 250° F. exit tempera-

ture, for 15 minutes and after sterilization placed on their slides and left undisturbed until the agar hardens.

At least 5 replicate specimens shall be prepared according to the method described under Section I-A. The samples are wet out (but not rubbed or squeezed) in water containing 0.05% Gardinol or a low concentration of other non-toxic wetting agent such as Igepal or Triton NE. They are then placed in 16-oz. culture bottles with caps as above described and sterilized by steam at 15 lbs. pressure for 10 minutes. When cool, one specimen shall be placed in contact with the agar medium in each bottle under aseptic conditions. One ml of the inoculum shall be distributed evenly over each specimen by means of a sterile pipette. The inoculated specimens shall be incubated at a temperature of 28-30° C. for a period of 14 days.

Strength loss determinations: Specimens shall be removed from the culture bottles at the end of the 14-day period, gently washed to remove any growth of mildew, dried at room temperature for 18-24 hours, then conditioned in an atmosphere of 65 ± 2% relative humidity and a temperature of 21-27° C. for not less than 24 hours prior to making strength loss determinations.

2. Chaetomium globosum—water agar test

This test is carried out exactly as described in I-B-1 except that water agar (20 grams agar per liter of distilled water) shall be used in the test vessels instead of mineral salts agar. The agar to be used in this test should be of high purity, i.e., such that a 2% water agar made from the preparation does not support the continued growth of Chaetomium globosum.

3. Aspergillus niger—glucose mineral salts agar test

Organism: Aspergillus niger ATCC 6275 (identical with A. niger USDA TC-215-4247). *Note:* Cultures may be purchased from the American Type Culture Collection, Georgetown University School of Medicine, 3900 Reservoir Road, N. W., Washington 7, D. C.

Culture medium: The culture medium shall have the same composition as that listed for Chaetomium globosum in the mineral salts agar test (I-B-1) with the addition of 0.75% glucose.

Inoculum: Sterilize about 40 cc of the above agar medium in each of the desired number of 250-cc Erlenmeyer flasks. After the agar has hardened, inoculate by use of a sterile needle with spores of the test fungus. After 5 days the culture should be in ripe fruiting condition. Prepare the spore suspension for inoculation by adding to the fruiting culture 50 cc of sterile distilled water containing a few glass beads and shake to bring the spores into suspension.

Culture chamber, inoculation, and incubation: These shall be the same in all respects as for the Chaetomium globosum test I-B-1 with the exception that glucose-mineral salts agar of the composition specified immediately above shall be used and that Petri dishes may be used instead of bottles at the option of the testing laboratory.

Evaluation of results: Growth shall be recorded as simply present or absent by visual examination with the unaided eye.

4. Aspergillus niger—water agar test

This test is carried out exactly as described under I-B-3 except that water agar containing 20 grams agar in a liter of distilled water shall be used in the test vessels instead of glucose-mineral salts agar.

5. Soil-Burial Test

Soil: The test soil* in air-dry condition shall be placed in trays, boxes, or other suitable containers to a depth of at least 5 inches and brought to optimum moisture content (see note*) by gradual addition of water accompanied by mixing to avoid puddling. After being allowed to stand for 24 hours, it shall be sieved through a ¼" mesh screen. Moisture content may be maintained uniform by covering the soil container with a suitable lid. The soil temperature shall be maintained at 30° C. ± 1° by controlling thermostatically the air temperature of the room in which the tests are conducted.

Incubation: The unsterilized test specimens shall be wet out as specified in the pure-culture tests above and placed in the prepared soil. Specimens may be buried vertically or horizontally as preferred, care being taken to secure uniform contact with the soil along the length of the fabric strip. They shall be incubated for periods of from one to six weeks, depending on fabric weight, severity of service requirements, and other factors to be considered in formulating the specification. During all periods of incubation the cellulose-destroying activity of the soil bed shall be such that after 7 days of burial specimens of the standard 8-oz. duck shall retain not more than 10% of their original warp breaking strength.

* Note: It is recommended that the AATCC Research Committee obtain and stock a standard soil that may be purchased for conducting uniform soil-burial tests. Types that have been found satisfactory for this purpose include garden and naturally fertile topsoils, composts, and greenhouse potting soils. These usually possess the proper physical characteristics, along with an organic content sufficient to insure a high degree of microbial activity and the presence of cellulose-destroying organisms. The optimum moisture content of such soils for testing purposes is about 65-70 per cent of their moisture-retaining capacity, or 25-30 per cent moisture above oven-dry weight.

(A more detailed description of soil-burial technique will be found in the American Dyestuff Reporter 34: 135, March 26, 1945. See also ASTM D684-45T. "Soil suspension" tests have been used in several laboratories. See Furry and Zametkin, Amer. Dyestuff Rptr. 32: 395-398. 1943. For further data on soil burial results see report on AATCC cooperative tests, American Dyestuff Reporter 34: 128-135, 139-140, 1945.)

C. PERMANENCE TESTS

1. Water leaching

The leaching shall conform in principle to the following procedure: Water from a faucet is passed into a constant-level water bath in which the water temperature is adjusted to 30° C. ± 1° by the use of thermostatically controlled electrical heaters. It is then passed through glass siphons at a constant rate to individual leaching vessels (1-quart Mason jars or equivalent), the rate of flow, 10 liters per hour per vessel, being determined by glass capillaries attached with rubber tubing to the delivery ends of the siphons. The capillaries are inserted down through the center of wire mesh cylinders in the leaching vessels and held in position by cross wires. The samples (for fabric, 5 standard test specimens) are fastened around the outside of the wire cylinders with rubber bands and leached 24 hours. The pH of the water shall be recorded and included in the report of test results.

2. Volatilization

Standard samples of the fabric to be tested are exposed continuously to dry heat at 150° ± 2° F. for 24 hours, in a well-ventilated oven.

3. Weathering

Portions of the material to be tested are exposed on a series of weathering racks at 45° to the horizontal facing south, between April 1 and October 1, in such manner as to avoid sagging or flapping. (It is recommended that locations and arrangements for exposure on a fee basis be furnished by the AATCC Research Committee and that such racks be set up in at least 4 locations within the United States, e.g., Washington, D. C.; Miami, Florida; New Orleans, Louisiana; and a suitable desert location.) One type of rack found convenient in practice has mounted upon it removable wooden frames to which are tacked four fabric pieces each cut 18" x 6" with the long dimension parallel to the filling. Each of these pieces yields ten standard 6" x 1½" strips for subsequent biological test. Weathering racks may be constructed to hold three or more of these removable wooden frames on each rack.

Section II
Testing the resistance of textiles to mildew

A. INITIAL MILDEW-RESISTANCE INDEX*

The initial mildew resistance index is determined by subjecting the unleached textile test specimens to Chaetomium globosum (I-B-1 and I-B-2), Aspergillus niger (I-B-3 and I-B-4), and specified soil burial (I-B-5) tests, and determining the mildew-resistance index as follows:

0=Undergoes significant loss in strength (greater than 15%) in the specified Chaetomium-water agar test, and exhibits evident growth in the Aspergillus niger-water agar test. This behavior is characteristic of an unprotected fabric of high mildew capacity. Such fabric will also be found commonly to develop a heavy visible growth of superficial and/or tendering fungi when incubated five or more days at 30° C. over water in a saturated-atmosphere humidity chamber without artificial inoculation. The fabric is also generally charac terized by a relatively high nitrogen content, i.e., 0.1-0.3%.

1=Undergoes no significant breakdown in the Chaetomium-water agar test, and no growth in the Aspergillus niger-water agar test, but significant strength loss in the Chaetomium mineral-salts agar test. This behavior occurs with fabric which is not inert to mildew but is of low mildew capacity or insufficiently protected by a fungicidal agent. Strength loss in the Chaetomium mineral-salts agar test is commonly 50-100%.

2=Undergoes no significant strength loss in either Chaetomium test, but shows evident growth in both Aspergillus niger tests and a significant loss in the specified soil burial test. This behavior occurs with fabric weakly to moderately well protected by a fungicidal agent but not inert to tendering effects by cellulose-decomposing fungi, as in gray goods poorly protected.

3=As 2 above except that no significant loss occurs in the specified soil burial test. This rating indicates the absence of toxicants and presence of sizing or other additives supporting fungus growth on an inert fiber. Example, nylon with starch, vegetable oils, etc.

4=As 3 above except that the failure to show growth in the Aspergillus niger-water agar test indicates freedom from additives favoring fungus growth, as pure nylon.

5=No visible growth in biological tests and no significant strength loss in the specified soil burial test. This rating would characterize a fabric (cotton or nylon type) well protected by a fungicide.

B. PERMANENCE-OF-MILDEW-RESISTANCE INDEXES

The permanence indexes are obtained as follows:

1. Leaching-resistance index

Standard samples of the material to be tested are subjected to the water-leach test described in I-C-1 above. The leached samples are tested by the Chaetomium globosum and soil burial methods specified above, and the leaching index is obtained as follows:

0=Undergoes significant strength loss in the Chaetomium test.

1=Undergoes no significant strength loss in the Chaetomium test, but suffers significant loss in the soil burial test in a two-week period of incubation.

2=Undergoes no significant strength loss in the soil burial test in a two-week incubation period.

2. Volatilization-resistance index

Standard samples of the materials to be tested are exposed to dry heat as described under I-C-2 above. The samples are then subjected to the Chaetomium-mineral salts agar and soil burial tests, and the ratings of 0, 1, and 2 obtained as indicated under II-B-1 above.

3. Weathering-permanence index

The material is exposed in conjunction with a sample of the standard untreated 8-oz. duck or untreated textile of the same composition, weight, and structure, for ten consecutive weeks on weathering racks as described under I-C-3 above and rated as follows:

0=Obvious mildew growth and the % strength loss greater than that of the untreated check.

1=No mildew growth but the % strength loss greater than the % strength loss of the untreated check.

2=Obvious growth but strength loss not exceeding the % strength loss of the untreated check.

3=No obvious growth and the % strength loss does not exceed the % strength loss of the untreated check.

If a weather-permanence index of 3 is obtained, the samples are then subjected to the Chaetomium-mineral salts agar and soil burial tests, and the ratings of 0, 1, and 2 obtained as indicated in II-B-1 above, giving a hyphenated rating of 3-0, 3-1, or 3-2.

Section III
Fungicidal potency and permanence of textile fungicides

A. STANDARD MINIMUM PROTECTIVE CONCENTRATIONS

The standard minimum protective concentrations shall be obtained as follows: Treat the standard 8-ounce bleached duck (to be purchased from the AATCC Research Committee) with the mildew preventive compound to give varying concentrations on the fabric. The minimum protective concentration (Chaetomium) is defined as the lowest concentration, in terms of per cent of the mildew preventive on the dry weight of the fabric, which will prevent significant fabric tendering in the specified Chaetomium globosum-mineral salts agar test (I-B-1). The minimum protective concentration (soil burial) is defined as the lowest concentration which will prevent significant strength loss over a two-week period in the prescribed soil burial test.

B. PERMANENCE INDEXES

The permanence indexes for textile fungicidal compounds shall be determined as follows:

1. Leaching-resistance index

This is calculated by dividing the minimum protective concentration (Chaetomium), as described in III-A above, by the minimum concentration for preventing tendering in the Chaetomium globosum-mineral salts agar test after having subjected the fabric to the standard 24-hour running water leach test, Section I-C-1, and multiplying the results by 100.

2. Volatilization-resistance index

This is calculated by dividing the minimum protective concentration (as described in III-A above) by the minimum concentration that prevents biological tendering in the Chaetomium globosum-mineral salts agar test after having subjected the fabric to the volatilization test, Section I-C-2, and multiplying the result by 100.

3. Weathering-resistance indexes

a. *Index for resistance to loss of compound due to weathering.* The mildew preventive compound is applied to the fabric at a known concentration equal to approximately 8 times the minimum protective concentration in the Chaetomium globosum test (as described in III-A above),

(Concluded on Page 282)

* "Mildew-resistance" as the term is used here refers to the tendency of a fabric to resist the tendering action of fungi regardless of the mechanism involved, whether it be due to the presence of a fungicidal agent, the inertness of the fiber to fungus enzymes, or an insufficiency of nitrogen and other inorganic elements required for fungus growth.

Plastics—

Unsupported FILMS AND SHEETINGS*

C. W. PATTON
Bakelite Corp.

YOUR Technical Program Committee, in choosing tonight's general subject of "Plastics," kept in mind two main considerations.

No. 1—the fact that most, if not all, of the members of the New York Section of the American Association of Textile Chemists and Colorists were not only aware of the many uses of plastics in the textile field but that many of you are now in intimate daily contact with these materials. Rainwear, shower and window curtains, aprons, shoe, handbag, and upholstery materials are but a few of the items involved.

No. 2—the statements of many members concerning the wide variation in properties of plastic products commercially available and of the lack of generally available background information to guide in the purchasing, fabricating, testing and designing in connection with these materials. These variations you have encountered strikingly illustrate the versatility of plastic materials but they are likely to be a trifle confusing to textile personnel who have had no occasion to be involved in the extensive development work carried on by certain branches of the plastics industry over a period of years.

It is intended that the discussions arranged for this evening will furnish you with a foundation on which to build a more definite understanding of the various properties obtainable in plastic materials. For example, it would be quite difficult for a person to work with textiles in the finished form if he were not reasonably familiar with the various fibers, carding, spinning, stretching and twisting processes involved in the making of yarn and basic weaving operations. In examining or utilizing plastic materials, it is much more difficult to realize or to determine the extent of prior compounding and processing by simple visual inspection of the materials because they are not ovbious in the finished material. To draw a rough analogy, the tell-tale marks of the fibers, yarns, and weaving operations which are reasonably evident in the ordinary fabric are literally rolled together into one homogeneous construction in the case of plastic films.

* * * *

Plastic film, or sheeting, in its simplest form, is made by taking a plastic such as this powder ,demonstrating) fluxing it together on hot rolls, and forming it into a sheet which, upon cooling, is quite rigid. Incidentally, we customarily refer to material less than .010" as a film, and material of greater than 10 thousandths of an inch in thickness, as a sheeting.

Now, if this plastic powder is mixed with a softening agent, known as a plasticizer, and the same process of mixing and rolling out is repeated, a flexible material results. You can readily appreciate that from simple visual inspection, it is practically impossible to tell what type of plastic has been used, and the type of plasticizer and the amount used. In other words, a homogeneous mass is produced with practically no evidence of its composition as would be in the case of a fabric where mixed silk and wool fibers were present, or where there was, for example, a rayon filling and a cotton warp.

Where it is desirable to have colored material, we go back to the beginning and as before blend together a powdered plastic, the plasticizer, and the coloring matter. Then, as mentioned before, the material is thoroughly mixed, and sheeted out to produce a colored flexible film. Since certain types of processing involve relatively high temperatures, it is desirable to have a small percentage of an additional ingredient present which is known as a stabilizer. The stabilizer aids in preventing a darkening of the plastic material which would, in turn, alter the hue of the coloring material. In some instances, the stabilizer also protects against any reaction with the color itself which might alter its color value. In addition, the stabilizer makes it possible to produce a film or sheeting material that will retain a high degree of its original color throughout the life of the end product.

To sum up, the plastic or resin, the plasticizer, coloring material and stabilizing agent are, in general, the four main ingredients of certain types of plastic film or sheeting.

Now the question naturally arises as to what happens when different types of these materials and different amounts are used. There are a number of different classes of resins which can be compounded into films or sheeting. Rather than attempt to cover all possibilities, we will consider the vinyl chloride-acetate resins which are a large factor in the field. It is possible, by using different members of this group, to produce products that range from soft, tacky films to strong, extensible, rubbery films. One type may have a resistance to flexing of only 300,000 cycles whereas another one will have a flex life of 3,000,000 cycles. This property is very important in deciding which resin to use for producing materials that go into items such as footwear.

The temperature at which the films or sheeting will tend to develop self-adhesion under given conditions of time, temperature, and pressure can be varied from 150° F. to 250° F. by using different base plastics. Thus, the selection of the base plastic is very important in producing items that are likely to remain folded together in packages for a long time prior to sale. It also affects the speed and ease with which heat-sealing operations can be performed during fabrication into finished items. The ability of the finished article to resist distortion under strain at elevated temperatures, while not so important for many consumer items, is of extreme importance in industrial fields such as electrical insulation. This property varies widely with the choice of resin.

Plasticizers vary widely in their ability to produce flexibility at lower temperatures. For example, we can have two differently plasticized compounds that are of approximately the same flexibility at room temperature but may vary widely at sub-normal temperatures. Low temperature flexibility is of importance for foodbowl covers and certain clothing items.

The migration of plasticizers to various surfaces that may come in contact

* Presented at meeting, New York Section, March 29, 1946.

with the film or sheeting is determined by the chemical and physical properties of the particular plasticizer involved.

Plasticizers vary widely in their volatility. In order to have a product retain its flexibility for long periods of time, it is necessary that the plasticizer not evaporate, otherwise the product will tend to revert to the stiffness of the unplasticized material.

Plasticizers also vary in their resistance to extraction by water. In producing film for shower curtains, obviously it is important to use a plasticizer which will not be removed by the continued action of water. As a matter of fact, there are a dozen or so characteristics of plasticizers that must be considered, depending, of course, on the proposed end-use of the film or sheeting.

The effect of different quantities of a given plasticizer, as we have already noted, is to produce various degrees of flexibility and extensibility.

As regards coloring materials, a wide variety are used to get practically all shades of the rainbow. The use of excessive amounts of coloring materials is liable to lower the strength and extensibility of the film or sheeting. In general, it is desirable to use colors which are insoluble in plasticizers so there will be no tendency of the color to transfer to similar plastic materials with which the colored film or sheeting may come into contact.

Stabilizers of different chemical compositions produce different effects; some of them are effective as protection against high temperature exposure during processing, others may have certain value in protecting color and clarity and still others may be of value in counteracting the effect of ultra-violet rays normally present in sunlight. Actually, a considerable portion of the value of the finished product depends on the choice of the proper stabilizer.

The methods of producing films also must be considered because, in general, there are certain specific properties imparted by the various processes. The five principal methods of manufacture are as follows:

(1) The Calendering Method: Briefly, this involves rolling the compound under heat and pressure between two steel rolls to produce a thin film or sheeting. Something like feeding a hot dough-like mass through a "glorified" textile padding machine. Incidentally, lubricants, or release agents, are usually employed in the calendering operation to facilitate removal of the film or sheeting from the calender rolls. These agents must be carefully selected so as to not interfere with heat-sealing or printing operations that may be subsequently performed on the film or sheeting.

(2) Solution Casting: The ingredients are mixed together and rendered liquid by the addition of suitable solvents, and applied to a large drum or endless belt. Upon evaporation of the volatile liquids, a film remains which can then be stripped from the supporting medium.

(3) Dispersion Casting: This is similar to the solution casting method except the method of producing the basic liquid material is different.

(4) Solution Extrusion: In this method a solution similar to the solution used in casting is extruded into water or other media and the volatiles extracted. This is roughly similar to the spinning of viscose yarn except the coagulating action is physical rather than chemical.

(5) Dry Extrusion. It is possible to extrude a tubing under heat and pressure by subjecting it to air pressure and stretching to expand the tube into a htin walled tubing which can be slit and wound up into roll form.

Cast films, whether prepared by the solution or dispersion technique, are likely to have relatively high tear strength and high gloss. In general, cast films are not produced in thicknesses in excess of four one-thousandths of an inch and can readily be made as thin as ½ thousandth of an inch. By the calendering technique, it is possible to produce both films and sheetings. About 3 to 4 thousandths is the minimum thickness of film that can be produced and about .020" is the minimum thickness of sheeting that can be calendered out. Thicker sheetings can be made by lamination.

The degree of gloss or flatness of a finished calendered film depends upon the surface characteristics of the steel rolls on the calender. The degree of glossiness or flatness, incidentally, affects such properties as slip, tear strength, and clarity. A flexible film or sheeting, having a perfectly smooth, glossy surface, will have better clarity but will not slide over itself as readily as similar material which has a matte or flat surface. In general, the tear strength, or resistance to tearing, of materials having perfectly smooth surfaces is higher than that of materials having roughened or embossed surfaces.

The various factors which we have mentioned represent relatively few of the factors involved in work with film and sheeting. Fortunately, there have been developed a wide range of test methods for determining the multitude of properties. There has been considerable experience obtained on the value of these materials in a wide range of products and this will constantly increase and provide an even wider background as a guide in correlating physical properties with end use performance. It should be kept in mind that it is not always possible to correlate physical properties of plastic materials with end-use results on the same terms as are used in conventional textile materials. For example, in setting up specifications for a fabric for shower curtains, one might say that a tensile strength of 25 pounds is required, not because the curtain would be required to hold up a certain weight but because that might be considered the minimum tensile strength which the fabric should have to possess reasonable durability. With a plastic film, due to the presence of many other factors, it might well be possible to produce a shower curtain that would outlast a conventional fabric my many times and yet not possess the same high degree of tensile strength.

To alert you against over-simplification of the film and sheeting field—to indicate how plastics research will constantly change the picture—and to illustrate further the wide range of properties obtainable in plastic material here is a film of plastic material that was developed during the war, which is composed of polymerized ethylene. This is a material that is reasonably flexible and yet contains no plasticizer whatsoever. This film, composed of polymerized ethylene, has excellent electrical and water-resistant properties. However, at the stage of manufacture represented by this sample (demonstrating), the film is readily distorted, but if further processed or stretched, somewhat as yarns are stretched, it then develops additional strength and resistance to deformation. With a material like this, processing obviously plays a very important part in its finished properties.

Now that we have briefly covered a few of the major considerations involved in working with plastic films and sheetings, we will learn from the subsequent speakers further considerations to be kept in mind in working with other types of plastic products.

DISCUSSION

Mr. Page: I would like to ask the relative volume of the different types of film. You listed five methods for making film. In what proportion is one method used compared with another?

Mr. Patton: That is pretty hard to say. I would say they are roughly in the order I gave them.

Mr. Page: Calendering is most popular?

Mr. Patton: Yes, I would say so.

Mr. Page: Is that 50 per cent, or 75 per cent, would you say?

(Concluded on Page 282)

Plastics—

PLASTIC MONOFILAMENTS*

M. R. RADCLIFFE

Plastics Research Division, Firestone Tire & Rubber Co.

RECENT developments in the plastics field have placed at the disposal of the textile industry a group of new yarns, plastic monofilaments. There have been a number of developments along this line, the most familiar one being nylon which has found wide spread use in monofilament form as a bristle. More recent are the development of monofilaments from resins of the vinyl group, particularly polyvinylidene chloride resins, polyvinyl chloride resins and polyethylene resins.

The feature which characterizes resins which are suitable for the fabrication of fibers is the quality of crystallinity. It is difficult to conceive of crystallinity in a flexible material such as a filament or fiber yet that is the basic reason for its ability to be stretched and remain stretched, thus forming a dimensionally stable thread. The process of stretching is called orientation since it is presumed to result in an alinement or orientation of the individual resin molecules along the fiber axis. By orientation, strength is improved in the order of four or five times.

By virtue of this same property there is not much latitude in the formulation of these filament forming resins because they are nonabsorptive and tend to squeeze out extraneous material. Plasticizers or lubricants, stabilizers and coloring materials may be incorporated but only in very minor amounts. The raw materials which comprise the average plastic filament are more than 90% resin and less than 2% colors and stabilizers, the remainder being plasticizers or lubricants. It would be difficult to use higher amounts of modifying agents and still obtain a usable filament or fiber.

The processing of filaments is like other plastic processes, a heat fabricating process. The steps through which the material goes are (1) preparation for extrusion, (2) extrusion, (3) orientation, (4) conditioning.

In the preparation of the resin for extrusion the formulative ingredients are blended in, colors are incorporated. A perfectly homogeneous blend of the various raw materials must be achieved before the powder is extruded.

The prepared resin may be a finely divided powder or it may be a pelletized product. It may be melted to a stiff molasses like melt at temperatures in excess of 300° F. By forcing the viscous melt through orifices fibers or filaments of various sizes or shapes are obtained. However, the extruded product as it comes from the extruder is not worth very much as a fiber or filament because of low tensile strength and brittleness or cheesiness. This is so because of the random arrangement of the individual polymer molecules.

The orientation process or stretching operation which is next applied brings order out of chaos as it were by inducing an orderly alinement of the individual molecules which results in the development of the properties by which we know these plastic fibers and filaments. The greater amount of stretch that we can give the filaments during this fabricating stage, the better will be the ultimate combination of properties. There is of course a limit to the amount of elongation that the plastic will tolerate. To achieve 100% of this in a commercial process is a practical impossibility. A possible reason for variation in properties among various products of a similar nature may well be the relative completeness of the orientation.

After going through a stretching operation, plastic filaments have a greater or lesser tendency to shrink depending upon their composition and the history of their fabrication. To eliminate shrinkage in the finished filament or fiber, a conditioning process is used whereby the strains which cause shrinkage are alleviated. Properly conditioned filaments in general will shrink less than one per cent.

Certain properties of plastic filaments are of interest. Tensile strength is one. So far these more recent plastic filaments have not equalled nylon in this property, but it is not inconceivable that they will. Plastic filaments have excellent resilience or recovery. It is conceivable that under inadequate fabricating conditions resilience will be sacrificed. Abrasion resistance of plastic filaments and fabrics therefrom is excellent. Laboratory evaluations are generally compared with leather and heavy duty textiles. That is probably because one of the more widely exploited uses for plastic filaments has been in transportation upholstery. The nonabsorptive qualities of the plastic fiber make it suitable for a great many applications where staining must be avoided. The same property renders the filaments and fabrics therefrom insoluble in solvents. It is therefore not easy to make adhesives for these plastic fabrics. The resistance to various types of degrading agents such as acids, alkalis and salt spray is in general very good. Noninflammability is another feature of certain of these plastic filaments which should qualify fabrics from them for certain particular applications.

During the war there were large quantities of plastic filaments fabricated into screening, shoe innersoles and webbing which were used by the armed forces in the tropics. In these applications, plastic monofilaments proved themselves not just against other textiles but against metallic screening in their resistance to fungus and mildew and in their ability to withstand the degrading and corroding atmospheres of the tropics.

The coloring of vinyl type monofilaments has been the subject of much investigation. There is little doubt that the only satisfactory method of coloring at the present time is to incorporate the color prior to the fabrication of the filament. Even by this means, coloration is more of a problem than it appears because so many colors are unsatisfactory for one reason or another, major problems being bleeding and crocking, heat stability during fabrication and light fastness. It is anticipated that plastic filaments will be available in a full range of colors and that these colors will be by usual textile standards very light fast.

The plastics industry looks forward to the use of plastic monofilaments in textiles where they should fit in because of some of the specific properties which they possess, particularly non-stainability, flameproofness, abrasion resistance, fungus and mildew proofness and perhaps because of a novel appearance and texture they may impart.

* Presented at meeting, New York Section, March 29, 1946.

Plastics—

Some Pitfalls in ACCELERATED TESTING*

R. E. THOMAS

Fabrics Division, E. I. du Pont de Nemours & Co., Inc.

IN the development of new and improved types of coatings for fabrics, it is obviously important to find out promptly whether the supposed improvements are real or apparent. After being confronted a number of times with the fact that accelerated tests alone do not always give a faithful answer, the technician is repeatedly faced with the necessity for deciding whether or not he will accept the results of his laboratory evaluation or whether he will defer his judgment until the completion of actual service tests.

It is not the purpose of this discussion to attempt to suggest new and better accelerated tests for any given product. It is felt that a warning should be sounded that in many fields accelerated tests are receiving great over-emphasis as a basis for demonstrating or judging the actual worth of a new product.

This does not mean that we in our work are not constantly striving for more reliable accelerated testing methods. We are guided, however, by the knowledge that serious pitfalls exist in accelerated testing processes, and we have learned by experience that many of these can be avoided by filing the results of the accelerated tests and waiting until consumer tests have gone far enough to demonstrate the worth of a new product. If actual service tests are favorable, accelerated testing devices can be brought into play, using the results obtained from service tests as reference points in the interpretation of data obtained in the accelerated testing device. Furthermore, with actual service test data at hand, it is possible to use the accelerated testing device as a laboratory control method on production. In other words, the testing device becomes a tool for assuring a high level of production quality.

The best means for illustrating my point that accelerated tests may lead to erroneous conclusions is to give you actual concrete examples showing that laboratory data were not confirmed by actual service tests.

I might say at this time that some of the examples that I will cite go back a good many years. One of the first jobs I had about twenty years ago had to do with the devising of test methods for lacquers of the type used in automobile bodies. In the course of this work I can recall two instances of accelerated testing which served as an early warning to us that some of these short-cut testing methods were always to be looked at as interesting but with not a little skepticism. In the early days of auto finishes and for many years thereafter, there was a crying demand for a maroon pigment which would be permanent enough in light resistance for use in an auto finish. I might say that there are few uses for organic finishes that are subjected to more severe service requirements than an auto finish exposed as it is to all sorts of climatic conditions, to sudden changes of temperature, and especially to strong sunlight in most instances many hours a day. I can recall a very attractive maroon pigment which looked fine on test panels and which was completely non-fading for several hundred hours in one of the standard fading devices available at that time, but which if exposed out-of-doors for a week or more faded to a beautiful brick red. A brief study of this situation made it quickly apparent that ultraviolet light alone was not the only factor involved in the lack of permanence of this color. It was a very simple matter to demonstrate that if the test panel were exposed in the fading device for eight hours and then immersed in water overnight, the color faded out to about the same extent that it did out-of-doors. The intriguing part of this simple experiment was that the pigment itself was insoluble in water and only those areas exposed to light were changed by actual immersion in water. In other words, exposure of the pigment to UV light brought about a change in the pigment structure so that upon immersion in water the light exposed pigment either dissolved in the water or changed to a different colored body by the combined action of the light plus the water. Light was the instrument that ultimately resulted in fading but no fading was obtained until water was introduced as part of the test cycle. I cite this very simple experience to indicate that reliance on a fading device involving light alone was found to be an unreliable gauge to the color fastness of a particular type of pigment.

In the course of the development work on nitrocellulose lacquers for auto finishes, it was recognized that an accelerated test duplicating out-of-door conditions would greatly expedite the formulation of testing of this type of finish. Probably one of the earliest accelerated weathering devices combining a source of ultra-violet light and a means for wetting the test panels was set up in the Parlin Laboratory of the DuPont Company. This gadget exposed the samples to UV light for a period of 15 minutes and then to a water spray for 20 minutes, this cycle being repeated over and over again with periodic examination of the test panels. By a combination of good fortune and the nature of the systems involved, it was found as the work progressed that the results obtained in this device were remarkably similar to results obtained out-of-doors. Full confidence in the results of the test, however, was not established until a set of panels systematically varied in composition had been exposed out-of-doors both at Parlin and in Florida.

In the course of this work an observation was made which emphasizes the subject of this discussion. It was found that this test was quite reliable in classifying the durability of finishes based on nitrocellulose coatings. However, when the same device was used on oleoresinous finishes the results were completely different. It was found that what is known as short-oil varnishes gave almost as good results as long-oil varnishes in the accelerated test in spite of the fact that short-oil varnishes might fail anywhere from a few days to several weeks when exposed out-of-doors, and spar varnishes would last for a very much longer period of time. In other words, the accelerated test which worked on one type of organic finish was totally inadequate for another type of organic finish. One explanation

* Presented at meeting, New York Section, March 29, 1946.

was that the action of ultra-violet light on the varnish type system versus the pyroxylin system was to cause the oil type finish to polymerize and harden to an apparently very durable material. Actually the material was durable exposed to a UV arc followed by water, but when exposed out-of-doors under actual consumer conditions the picture was totally different. Out-of-doors the oleoresinous finishes gradually became case hardened by the action of sunlight. The underlying layers of still unchanged resin remained semi-fluid and with further action of heat of the sun, possibly with moisture absorption through the case hardened film, the result was a film which cracked at the surface and once cracked developed a very bad over-all appearance. To repeat, the accelerated test gadget in question was a fairly reliable instrument for gauging the relative durabilities of nitrocellulose coatings but not of oleoresinous coatings. The use of artificial weathering devices on the newer synthetic resin finishes is fraught with some danger unless confirmed by out-of-door tests.

As I stated earlier, most of us during the war were engaged in developing products for use by the Armed Forces. The specifications attempted to define the product, hoping that the definition of properties would guarantee as far as possible satisfactory durability of the resulting product. Examples could be cited of coated fabrics made from at least three totally different synthetic resins, each formulated with the best known plasticizers and pigments, and each of the three classes of compounds met the specifications as written. However, it is known that the actual performance of these materials was totally different. Possibly it can be said that in the emergency all three materials served a useful purpose; it might be said that they adequately met the needs of the Armed Forces in supplying materials which under the best conditions were expected to have a relatively short but useful life. However, the great disparity in performance of these three materials would cause anyone to question the soundness of any collection of tests involved in a given specification as the basis for designing and offering for general public use coated fabrics of the type referred to.

Another instance which we can cite from our own experience is an attempt to evaluate a certain type of synthetic resin as a coating for fabric in the manufacture of shoes where, due to leather shortages existing during the war, it became desirable to investigate that particular field. While I am not in a position to identify the particular resin involved, I will say that it is a material which has not been offered commercially for shoe work. This material when deposited on fabric and subjected to a laboratory flexing device could be flexed from 10,000,000 to 30,000,000 times before developing a crack. Several hundred pairs of shoes were made in which the right shoe was made of genuine leather and the left shoe with synthetic coating referred to. The shoes were placed on test using High school students as "guinea pigs." It was found that the synthetic coatings in spite of the high flexing obtained in the laboratory, failed quite badly in periods varying from a few weeks to several months. The point we want to emphasize is that a flexing test per se was not enough to indicate what would happen in actual use. A great many questions can be asked about such an instance and we could elaborate on the various hypotheses advanced regarding the reasons for failure of material of this kind. A few obvious questions are: (1) If the material flexed 30,000,000 times at room temperature, how many times would it flex on a cold day? (2). Is it possible that the material would flex extremely well in a fairly dry state, but how many times would it flex if subjected to moisture as on a rainy day? It is not my purpose to describe or analyze the reasons why this particular material failed but rather to indicate that a product showing unusually high flex resistance under one set of laboratory conditions does not indicate that the material is going to stand up under the severe flexing conditions involved, say, in a pair of shoes. It is our opinion, based not only on this experience but others, that laboratory tests applied to materials for use in shoes are pretty risky, and the best proof of wearability of synthetic materials for shoe manufacture is obtained by the slower and more tedious method of actual service tests. I would like to add that it has been our experience that testing a half dozen or a dozen pairs of shoes will not give a good answer. Differences in the way individuals treat the object under test can only be established by including in a test a substantial number of wearers, the more the better.

A similar experience can be cited in connection with coated fabrics for upholstery purposes. Several years ago we had developed a coating which from all laboratory tests apparently represented outstanding progress in the field of coated fabrics for upholstery use. This development was made just prior to the war and we were able at that time to have a number of our own trucks outfitted with this material. The tests were started in the late fall and were in excellent condition all during a very cold winter and were still in excellent condition up to the beginning of the following winter. However, following the first real cold spell of the second winter, it was found that the coating had cracked very badly. These results were later confirmed by a large furniture manufacturer which has done outstanding work in the testing and promotion of high grade upholstery materials. Their experience paralleled ours in finding that material gave better results in their laboratory testing devices than anything they had previously examined, and yet they found as we did that the material used as a covering for seats and buses failed much sooner than they could possibly have predicted on the basis of previous accelerated laboratory tests. Here again the analysis of the reason for failure of this type of coating we need not go into in any detail. We do know that in this particular instance failure was very pronounced in the area coming in contact with the body. It was quite obvious that either perspiration or some other factor had caused these areas to become embrittled. We found, however, on analysis, that the plasticizer content of the coating in those areas coming in contact with the body was appreciably lower than in adjacent areas which were still in fair condition. It was apparent that the plasticizer was absorbed or otherwise removed from the coating in these areas, and the film quality was adversely affected thereby. An additional factor contributing to the failure of this material was the well-known fact that these coatings, originally extremely tough and flex resistant, lost their toughness and flex resistance on continual exposure to sunlight. In other words, coatings of this kind which would resist several hundred thousand flexings initially were found to flex less than one hundred times when exposed continuously out-of-doors for six months to a year. Substantial improvement in retention of flexibility can probably be effected in this type of coating by the selection of certain types of plasticizers. At least we find from outdoor tests that some improvement in this regard can be brought about and actual service tests on trucks and buses are in progress to confirm our early findings. I would emphasize, however, that in our opinion there is no reliable accelerated laboratory device which will give a faithful evaluation of such supposed improve-

ments, and it becomes necessary to go through the time consuming, tedious business of testing material under actual conditions of use in order to get the real answer.

There are many more items in the field of coated fabrics which could be discussed along lines similar to what I have already said. We have arrived at the conclusion that the best way to test coated fabrics for the items mentioned and for a myriad of others such as shower curtains, baby pants, bowl covers and similar products is actually to try them out under conditions of use and rest our judgment on the results of these tests. We know of no combination of anchorage tests, hydrostatic tests, heat aging tests, cold crack or anything else which will *guarantee* the user or the manufacturer that some combination of conditions met with in service may not cause an early failure of his product. We have no intention of disparaging the work of those who are working earnestly as we think we are toward developing reliable accelerated testing methods. No one wants to see such tests devised and developed as a reliable basis for merchandising new products more than we do, but it was felt that a description of experiences such as we have had might be helpful to others in avoiding some of the pitfalls encountered in the accelerated testing of coated fabrics.

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Films and Sheetings–

(Concluded from Page 278)

Mr. Patton: Well, I would say roughly 30 to 50 per cent.

Mr. Page: The last method, extrusion, that wouldn't be very popular at all, then, is that right?

Mr. Patton: Well, it is all relative. All five of them might be. It is not a matter of popularity, it is a matter, I think, of existing equipment or skills that have been gained by different types of manufacturers. A man who would, in the past, have been engaged in the making of regenerated cellulose might have equipment for making film in that manner.

Joseph C. Goodavage: Mr. Patton, I would like to know something more about the chemical characteristics of that particular film that requires no plasticizer. I think you mentioned that in your talk.

Mr. Patton: As briefly as I can say, it is polymerized ethylene. Ethylene is a hydrocarbon, a gas, and can be polymerized under certain conditions to give a plastic material. Chemically speaking, it is very similar to paraffin wax in its chemical composition. You might say it was a "super paraffin." It has much greater tensile strength and properties of that nature, and yet chemically it is very similar. Is that enough description?

Mr. Goodavage: Can you identify it as a commercial product?

Mr. Patton: Poly-ethylene and Polythene.

Mr. Reeser: Is it possible that you will ultimately develop a plastic sheeting that has a certain amount of porosity?

Mr. Patton: Well, I wouldn't say it was impossible. You see all of these materials could be made in fibrous form, they might be matted together. I have seen people punch them full of holes. I imagine some day it may be achieved.

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Mildew and Rot Resistance–

(Concluded from Page 276)

and exposed to sunlight on a weathering rack at 45° to the horizontal facing south, for a period of 10 weeks between April 1 and October 1. Where accurate and readily-applicable procedures are known, the concentration of mildew preventive remaining on the fabric after 10 weeks' exposure shall be determined. The index is obtained by dividing the residual concentration of mildew preventive by the original concentration, and multiplying the result by 100.

b. *Index for lack of primary damage to the fabric.* To test stability of the compound with respect to the formation of substances harmful to the fabric during weathering, the mildew preventive is applied to the fabric at approximately 8 times the minimum protective concentration, and exposure for 10 weeks is made as described in I-C-3 above. An untreated check sample of the fabric is similarly exposed. The primary damage index is determined by dividing the final breaking strength after exposure by the breaking strength of the similarly exposed untreated sample and multiplying the resultant figure by 100.

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MEETING, SOUTHEASTERN SECTION

A MEETING of the Southeastern Section was held on April 20 at the Ralston Hotel in Columbus, Georgia. A. Kempton Haynes presided.

After the dinner Mr. Haynes introduced the special guests: Paul McKinney, President of Swift Manufacturing Company; E. W. Swift, Sr., Chairman of Board, Muscogee Manufacturing Company; and Frank B. Bradley, Executive Vice President of Eagle & Phenix Mills. The introduction of other guests and visitors and the various committee reports followed.

W. B. Griffin, program chairman, introduced the speakers: M. T. Barnhill and Paul McKinney. Mr. Barnhill talked about the effect of different dyestuffs on the weathering of dyed fabrics. Mr. McKinney gave an inspirational talk on "You and Your Job."

Mr. Haynes appointed Norman Arnold chairman of a committee to foster student chapters at the Alabama Polytechnic Institute and at the Georgia School of Technology.

Respectfully submitted,
HOWARD M. WADDLE,
Secretary

MEETING, NEW YORK SECTION

THE last meeting of the 1945-46 season of the New York Section was held on May 3rd at the Downtown Athletic Club, New York City. An informal dinner preceded the meeting.

Patrick J. Kennedy reported on the activities of the councilors during the past season. Paul J. Luck, treasurer, reported that, as of March 29th, there was a substantial balance. Norman A. Johnson, secretary, reported that minutes of all previous meetings had been published.

The report of the nominating committee, composed of Robert O'Hara, chairman, Kenneth H. Barnard and Clark Heydon, was presented by Mr. Barnard. The slate of officers recommended by this committee was as follows:

Chairman: Dr. Herman E. Hager.
Vice-Chairman: Charles W. Dorn.
Treasurer: John H. Hennessey.
Secretary: Norman A. Johnson.

Councilors: Patrick J. Kennedy, Leonard S. Little, George L. Baxter, Thomas F. O'Brien, Emmett J. Driscoll and Charles H. A. Schmitt.

Sectional Committee: Patrick J. Kennedy, Emmett J. Driscoll and George L. Baxter.

These officers were unanimously elected.

Emmett J. Driscoll, chairman, reported that an outing of the New York Section would be held on June 21st at the North Jersey Country Club. The attendance will be restricted to members only, due to the limited facilities available. Members of the outing committee are: R. Timothy Gibson, chairman; Hugo Todebusch, golf; John H. Hennessey, prizes;

Paul J. Luck, finance; Robert Holoch, horseshoe pitching; Winn W. Chase, press; Dr. Herman E. Hager, dinner; and Charles W. Dorn, prize awards.

The speaker on the technical portion of the program was Dr. Ralph T. K. Cornwell, Director of Research of the Sylvania Industrial Corp., Fredericksburg, Virginia. His subject was: "Cellulose Ethers and their Application to Cellulose Fibers."

The attendance was 238.

Respectfully submitted,
NORMAN A. JOHNSON,
Secretary

MEETINGS, RHODE ISLAND SECTION

THE meeting of the R. I. Section was held on April 26th at the Providence Engineering Society Hall, Providence, R. I. Approximately 150 persons were present.

Peter G. Kolupaev, Chief Chemist of the Slatersville Finishing Co., spoke on "Color Measurement and its Textile Applications." In his talk he reviewed the science of color and the more important textile applications of this knowledge.

Edwin Blanchard Brown, Instructor of Professional Design at the R. I. School of Design talked on "Color—of the Heart and of the Mind." Mr. Brown approached this subject from the psychological and aesthetic viewpoints. He also supplied artistic textile designs made at the R. I. School of Design for inspection of the members present.

SPECIAL MEETING

A special meeting was held on May 2nd at the Providence Engineering Society Hall.

The U. S. Army Q.M. sponsored a talk accompanied by films on the newly developed three dimensional photography technique for the inspection of textiles. Harry F. Schoenfelder, Experimental Engineer, Headquarters, Quartermaster Corps Inspection Service, delivered the talk. Photographs of textile defects and the glasses to observe the three dimensional effect were supplied after the meeting to those interested in further observing some of the results obtained thus far. Approximately 185 persons were present at this meeting.

NOTICE

The Rhode Island Section will hold their annual outing at the Pawtucket Golf Club on Friday, June fourteenth. The usual golf tournament and putting tournament will be held. A R. I. Clambake will be served at 6:30 P.M. Tickets may be obtained from A. Newton Graves, Franklin Process Company, P. O. Box 1356, Providence 1, R. I.

Respectfully submitted,
JAMES C. SHORE,
Secretary

MEMBERSHIP APPLICATIONS

SENIOR

Joseph M. Almand—Dir. Chem. Research, Cen. Dev. Dept., Text. Div., United States Rubber Co., Stark Mills, Hogansville, Ga. Sponsors: A. K. Haynes, A. E. Howell.

James E. Baker—Technical Sales Repres., Morton Chemical Co., Greenville, S. C. Sponsors: R. J. Beauregard, J. R. Morton.

Newell M. Bigelow—Res. Chemist, du Pont Co., Deepwater, N. J. Sponsors: C. A. Seibert, C. A. Sylvester.

Charles J. Britt—Finisher, Kennedy & Britt, Philadelphia, Pa. Sponsor: M. M. Klotz.

Jan Buter—Manager, Fa. Gebr. van Heek, "Schuttersveld" Enschede, Holland. Sponsors: W. B. Wilson, H. E. Hager.

Luke J. Carbonetti—Supervisor, Finishing, Stonecutter Mills Corp., Spindale, N. C. Sponsors: W. C. Ragin, Jr., W. S. Sims.

Herman Dalenoord—Manager, N. V. Boekelosche Stoombleekerij, Boekeloschestraat 400, Boekelo, Holland. Sponsors: W. B. Wilson, H. E. Hager.

Henry P. Danesi—Secretary and Treasurer, Supreme Skein Dyeing Corp., Brooklyn, N. Y. Sponsors: W. H. Espelin, K. E. Leslie.

Salvatore Di Gregorio—President, Reliable Knit Goods Processing Co., Inc., Brooklyn, N. Y. Sponsors: W. H. Espelin, K. E. Leslie.

Bernard K. Easton—Chemist, American Viscose Corp., Stds. Dept., Marcus Hook, Pa. Sponsors: L. Fusser, L. S. Thompson.

Herman Eisenstat—Dyer, Crescent Hos. Dye Co., New York, N. Y. Sponsors: A. C. Mackey, E. W. Peters.

Thomas Elberson — Foreman Dyer, Thomas L. Leedom Co., Bristol, Pa. Sponsors: H. E. Millson, R. B. Stehle.

Bernard Factorow—Owner and Dyer, European Dye. & Fin. Co., New York, N. Y. Sponsors: W. P. Kampf, H. G. Gendreau.

Charles C. Fagan—Chemist, C. H. Masland & Sons, Carlisle, Pa. Sponsors: W. Z. Leaphart, H. K. Kerr.

Grady E. Faulkenberry—Dyer, Cannon Mills Co., Concord, N. C. Sponsors: A. R. Thompson, S. L. Hayes.

Wendell G. Faw—Supervisor of Textile Development, Tennessee Eastman Corp., Kingsport, Tenn. Sponsors: C. E. Bachelder, G. W. Hakanson.

Lawrence H. Flett—Dir., New Products Div., Nat. Aniline Div., Allied Chem. & Dye Corp., New York, N. Y. Sponsors: L. F. Koberlein, C. C. Knights

John A. Folk—Partner, Tek. Craft Printing Co., Bronx, N. Y. Sponsors: W. H. Espelin, J. P. Bauer.

Louis Gerry—Textile Dyer, Supreme Textile Printers, Inc., Long Island City, N. Y. Sponsors: B. Gruenwald, H. S. Gerry.

Rudolf G. Hallbagen—Tech. Manager, Norrkopings Bomullsvaveri A. B., Norrkoping, Sweden. Sponsors: C. Conradi, C. A. Sylvester.

Gerard Heine—Lab. Technician, American Aniline Products, Inc., New York, N. Y. Sponsors: W. D. Baird, J. J. Marshall.

Kurt G. Hennig—Technical Manager, A. B. Hugo Hennig, Boras, Sweden. Sponsors: C. Conradi, C. A. Sylvester.

John P. Hollihan, Jr.—Research Chemist, American Viscose Corp., Marcus Hook, Pa. Sponsors: C. Schlatter, B. N. Baer.

Edwin G. Iverson—Master Dyer, Libertyville Textiles, Inc., Libertyville, Ill. Sponsors: A. G. Alexander, J. G. Morgan.

Claude W. Jordan—Chemist, Consultant for MacDermid, Inc., Waterbury, Conn. Sponsors: A. E. Jones, J. W. Jordan.

Henry M. Kaufman—Chemist, Dyer and Colorist, Allied Textile Printers, Paterson, N. J. Sponsor: H. P. Baumann.

John F. Keating—Chemist, Cotton Chem. Fin. Div., Southern Reg. Research Lab., New Orleans, La. Sponsors: W. D. Appel, W. H. Cady.

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CALENDAR OF COMING EVENTS

NORTHERN NEW ENGLAND SECTION
Outing: June 7
(Andover Country Club, Andover, Mass.)

RHODE ISLAND SECTION
Outing: June 14.
(Pawtucket Golf Club, Pawtucket, R. I.)

PHILADELPHIA SECTION:
Outing: June 14
(Atlantic City Country Club, Northfield, N. J.)

NEW YORK SECTION:
Outing: June 21
(North Jersey Country Club, Paterson, N. J.)

MID-WEST SECTION:
Outing: June 22
(Lake Lawn, Delavan, Wis.)

SOUTH CENTRAL SECTION:
Meeting (Tentative): September 21
(Patton Hotel, Chattanooga, Tenn.)

SUB-COMMITTEES:
Meetings: June 13
(Hotel Commodore, New York City.)

COUNCIL:
Meeting: June 14
(Hotel Commodore, New York City.)

RESEARCH COMMITTEE:
Meeting: June 14
(Hotel Commodore, New York City.)

NATIONAL CONVENTION:
Silver Jubilee Convention: December 12, 13 and 14.
(Hotel Statler, Boston, Mass.)

Evaluation and Comparison of Two Commercial BLEACHING PROCESSES

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ABSTRACT

Samples of identical broadcloths taken from the center of a kierload of several thousand yards processed by a double-boil hydrogen peroxide-bleach method and samples of a similar kierload processed by a single-boil hypochlorite bleach were not essentially different in their properties. Although the former process was more laborious, more costly, and considerably slower than the latter, only the highly accurate techniques suitable to the research laboratory would differentiate the fabrics produced since visual inspection and the usual control tests applied in the bleacheries did not reveal any differences. Fluidities in cuprammonium hydroxides were the only analytical values that varied significantly, favoring only slightly the double-boil hydrogen peroxide process. The data suggest that some shortening of the kierboiling time in the conventional kierboil-hypochlorite bleach process would in some respects enhance the quality of output without sacrificing any valuable property.

INTRODUCTION

IN a southern bleachery recently visited, two methods of bleaching cloth were in use: a regular kierboil with hypochlorite bleach and a double kierboil with a hydrogen peroxide bleach after the second boil. The latter process was much more costly and was reserved for finer fabrics. In some cases there appeared reason to believe that nothing was gained by the more costly procedure and that the regular kierboil with hypochlorite bleach would suffice as well for the finer fabrics. Since it appeared that evaluation of the two processes would be of general interest to the textile industry, they were studied to determine whether the double boil was actually of sufficient advantage to warrant its continued use. The effectiveness of the two processes was measured by following identical pieces of cloth located in the centers of the kierloads through each of the processes, taking samples after the principal steps, and conducting extensive physical and chemical analyses of the samples collected. The data obtained in this study not only afford a comparison of two bleaching processes but provide as well comparative data on the progressive cleansing of a fabric in the two processes. They also reveal the effectiveness of a kierboil in which no kier assistants, wetting, or other agents are employed. Research laboratory methods disclosed differences in good commercial fabrics that the less accurate control techniques usually applied did not reveal.

SINGLE-BOIL HYPOCHLORITE BLEACH

The conventional hypochlorite bleach method used consisted of the following steps:

1. Wet with 2- to 3-per cent malt diastase at 140° F. and pile in a bin for 2 to 3 hours. (The temperature remains near 140° F. during storage.)
2. Wash and pass through 1½-per cent sulfuric acid (2° Tw.) and again wash without steeping.
3. Neutralize excess acid with sodium carbonate in the kier and boil for 10 hours (approximately 8 hours after full pressure is reached) at 15 lbs. pressure in 3.6-per cent caustic soda (on weight of the goods).
4. Wash thoroughly in the kier and pull from the kier through a washer.
5. Bleach with sodium hypochlorite (¾° Tw. or 1.875 pounds of liquid chlorine per thousand pounds of cloth) and pile in a bin for about 1 hour.
6. Wash and antichlor with approximately 0.1-per cent sodium bisulfite ($NaHSO_3$).
7. Wash well and transfer to the white bins.

DOUBLE-BOIL HYDROGEN PEROXIDE BLEACH

This method consisted of the following steps:

1. Wet with 2- to 3-per cent malt diastase at 140° F. and pile in a bin for 2 to 3 hours. (The temperature remains near 140° F. during storage.)
2. Boil for 5 hours (approximately 3 hours after full pressure is reached) at 15 lb. pressure in 2.5-per cent caustic soda (on the weight of the goods).
3. Drain the kier and wash the cloth thoroughly in the kier.
4. Pull the cloth from the kier through 1½-per cent sulfuric acid (2° Tw.) and a washer into a second kier.
5. Neutralize excess acid with sodium carbonate in the kier, drain, and boil for 8 hours (approximately 6 hours after full pressure is reached) at 15 lb. pressure in 1.1-per cent caustic soda (on the weight of the goods).
6. Wash thoroughly in the kier and bleach 5 hours (approximately 4 hours after temperature is reached) at 180° F. with ½ volume hydrogen peroxide buffered to approximately pH 11 with sodium silicate.
7. Wash thoroughly in the kier and pass the cloth through a washer into the white bins.

MATERIALS

The cotton fabric used for this investigation was gray broadcloth having 136 warp and 64 filling yarns to the inch, and weighing 4.12 ounces per square yard, or 3.88 square yards per pound. Two yards of the gray cloth were held as the control. The balance of the piece was divided and one-half put through each of the processes. Samples approximately 2 yards long were taken after each of the principal operations. In the single-boil method, samples were taken after steps 1, 2, 4, and 7; and in the double boil, after steps 1, 3, 4, and 7. A bleached sample from each method was run through the water mangle and over the dry cans; all other samples were air-dried. Together with the control, these samples of cloth constitute the materials for analysis.

ANALYTICAL METHODS

Yarns per inch were counted with a Suter pick counter with broad-field lens and traveling needle. Shrinkage was computed from the change in the number of yarns per inch by the formula:

[1] One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

TABLE I. The Physical Analyses of Fabrics from Two Commercial Bleaching Processes

Sample No.	Treatments	Yarns per inch Warp	Filling	Change In[1] Length %	Width %	Shrinkage %	Breaking Strength Warp lb.	Filling lb.	Adjusted breaking strength[2] Warp (136 yarns) lb.	Filling (64 yarns) lb.	Thickness inches	Weight oz./sq. yd.	sq. yd./lb.	Reflectance Whiteness	Yellowness
	HYPOCHLORITE BLEACH														
K 607	Gray control	136	64	—	—	—	79.3	33.0	79.3	33.0	.0114	4.12	3.88	.3684	.2133
608	Desize and wash	138	65	—1.54	—1.45	2.97	74.1	33.1	73.0	32.6	.0130	3.96	4.04	.3920	.2051
609	Desize, wash, sour, wash	140	66	—3.03	—2.86	5.80	73.1	33.4	71.0	32.4	.0132	3.89	4.11	.3880	.2054
610	Desize, wash, sour, wash, kierboil, wash	139	67	—4.48	—2.16	6.54	81.7	41.1	80.0	39.2	.0132	3.80	4.21	.7346	.0854
611	Desize, wash, sour, wash, kierboil, wash, hypochlorite bleach, air dried sample	141	67	—4.48	—3.55	7.86	81.2	40.3	78.3	38.5	.0133	3.83	4.18	.8640	.0421
612	Same as 611, sample given water mangle and dry cans instead of air dried	143	60	+6.67	—4.90	—1.44	85.2	37.4	81.1	39.9	.0099	3.50	4.57	.8869	.0421
	PEROXIDE BLEACH														
607	Gray control	136	64	—	—	—	79.3	33.0	79.3	33.0	.0114	4.12	3.88	.3684	.2133
613	Desize and wash	138	65	—1.54	—1.45	2.97	76.0	33.6	74.9	33.1	.0129	3.83	4.18	.4265	.1958
614	First boil, before sour	140	65	—1.54	—2.86	4.35	76.0	34.7	73.8	34.2	.0123	3.80	4.21	.6255	.1264
615	First boil, sour and wash	140	67	—4.48	—2.86	7.21	79.4	34.4	77.1	32.8	.0125	3.79	4.22	.7195	.0929
616	Boil, sour, wash, peroxide boil, wash, air dried sample	141	67	—4.48	—3.55	7.86	80.5	41.2	77.7	39.3	.0120	3.77	4.24	.8624	.0397
617	Same as 616, sample given water mangle and dry cans instead of air dried	141	59	+8.47	—3.55	—4.63	82.9	35.4	80.0	38.4	.0091	3.57	4.48	.8666	.0405

[1] Computed from changes in yarns per inch.
[2] Computed from yarns per inch and breaking strength.

Percentage shrinkage =

$$\left[\, 1.00 - \left(\frac{Wo}{W} \times \frac{Fo}{F}\right)\right] \times 100$$

where Wo is the warp thread count of the control

W is the warp thread count of the sample

Fo is the filling thread count of the control

F is the filling thread count of the sample.

A minus shrinkage represents an increase in yardage. This occurred with samples *612* and *617* (Table I). Breaking strengths were made by the raveled-strip method (1, p. 78). Strips were cut 6 inches long by 1¼ inches wide, raveled to 1 inch and broken on a pendulum-type Scott Tester. Thickness and weights were determined by the ASTM procedures recommended in designation D39-39, (1, p. 76). For measurement of yarns per inch, breaking strengths and thickness, each reported figure is the average of ten determinations. Shrinkages were calculated on the average number of yarns per inch. Reflectance was measured on a Hunter Reflectometer *(7)* by the method outlined in National Bureau of Standards Circular, C429, (8, p. 42). This method measures apparent reflectance as a function of wave length in the ICI trichromatic coefficients of the spectrum by the use of filters calibrated with magnesium oxide. A whiteness of 1.00 is pure magnesium oxide white, which has a corresponding zero yellowness. Moisture was determined on ½-gram samples weighed in an air-conditioned laboratory at 70° F. and 65 per cent relative humidity and dried to constant weight at 105° C. in aluminum moisture dishes. Regains were calculated from moisture data. Alcohol-soluble materials are the extracts from 6-hour Soxhlet extractions of 5-gram samples dried and weighed in tared beakers. Wax was determined by the Conrad method *(4)* which employs hot alcohol (above 60° C.) as the extracting medium, since alcohol, especially when hot, according to Bloor *(2)*, is probably the most inclusive wax solvent known. This technique is more efficient and complete, within a reasonable extraction period, than any other technique tried for the extraction of this complex group of substances.

Fluidity in cuprammonium hydroxide was determined by using the Conrad velocity gradient techniques *(3)*. The Fr gher and Probert method *(5)* was used fo ash and ash alkalinity determinations.

DISCUSSION

The results are summarized in Table I and II. The similar changes in thread counts and yardage which occurred in both the hypochlorite- and hydrogen peroxide-bleach processes were about what are generally observed in bleachery experience, revealing no significant difference between the processes (Table I). Breaking strength was lowered in all cases by the desizing, souring, and washing treatments. A subsequent increase in the breaking strength, which took place in

TABLE II. The Chemical Analyses of Fabrics from Two Commercial Bleaching Processes

Sample No.	Treatments	Moisture %	Regain %	Alcohol-Soluble Material %	Wax %	Ash %	Ash alkalinity Per 100 grams dry sample	Fluidity rhes C = 0.5g/100 ml. C = 500 Sec.
	HYPOCHLORITE BLEACH							
K 607	Gray control	7.08	7.62	2.05	1.32	.74	12.50	2.06
608	Desize and wash	6.55	7.01	1.71	1.38	.27	6.10	2.14
609	Desize, wash, sour, wash	6.48	6.93	1.34	1.36	.26	4.84	2.26
610	Desize, wash, sour, wash, kierboil, wash	6.40	6.84	.37	.34	.10	1.86	2.68
611	Desize, wash, sour, wash, kierboil, wash, hypochlorite bleach, air-dried sample	6.38	6.81	.38	.32	.08	1.40	4.50
612	Same as 611, sample given water mangle and dry cans instead of air dried	6.00	6.38	.31	.26	.08	1.53	4.73
	PEROXIDE BLEACH							
607	Gray control	7.08	7.62	2.05	1.32	.74	12.50	2.06
613	Desize and wash	6.68	7.16	1.74	1.41	.24	4.60	2.47
614	First boil, before sour	6.50	6.95	.83	.76	.16	5.84	2.54
615	First boil, sour and wash	6.72	7.20	.44	.49	.04	1.54	2.50
616	Boil, sour, wash, peroxide boil, wash, air-dried sample	6.67	7.15	.26	.26	.05	.74	3.98
617	Same as 616, sample given water mangle and dry cans instead of air dried	5.85	6.21	.42	.34	.12	1.64	4.17

both processes as the bleaching progressed, did not necessarily reflect a true increase in the strength of the cloth. Many factors, some of which are not yet well understood, such as wax removal, fiber strength, harshness, slippage, fabric assistance, and changes in the number of yarns per inch may alter breaking strength values.

The fluidities in cuprammonium hydroxide, which reflect changes in the cellulose itself, showed a steady increase throughout each bleaching process (Table II). When judged by this measurement, the double-boil hydrogen peroxide bleach is to be preferred to the single-boil hypochlorite bleach. The advantage, however, is not great. The British Fabrics Research Committee (6) classed fabrics having a fluidity of 1 to 5 as "mildly scoured and bleached." The values here reported, because of differences in analytical methods, are not strictly comparable with those of the Fabrics Research Committee. They are, however, close enough to indicate that none of the samples has been excessively degraded in processing.

In both bleaching procedures, alcohol-soluble materials and wax analyses are in line with those generally obtained in efficient bleaching (Table II). These analyses do not reveal any advantage of one process over the other. A comparatively low percentage of wax remaining in the cloth is a striking result since cotton contains a considerable quantity of true waxes which resist saponification so strongly that complete removal is difficult if not impossible.

When judged by reflectance measurements, there is no significant difference between the two bleaching processes (Table I). The measurements in both processes show production of much better whiteness than is normally found in commercially bleached fabrics. The slight difference between the two finished samples is practically within the limits of precision of the method used and is too slight for sure visual detection even by those accustomed to comparing whiteness differences.

Fluidity data, besides indicating some slight advantage of the hydrogen peroxide bleach, when used to evaluate the various steps in these bleaching processes, show that the hypochlorite treatment was the most harmful the fabric received. The water mangle and dry cans, a treatment lasting only a few minutes, damaged the cloth more than the 5-hour kierboil and nearly as much as the 10-hour kierboil.

A comparison of the results from Samples 610 and 615 (Table III) shows that at the end of 7-8 hours' preliminary treatment of the broadcloth in the peroxide bleach process (Sample 615) and at the end of 12-13 hours' preliminary treatment of the brodcloth in the hypochriorite bleach process (Sample 610) practically identical analytical values have been obtained. The latter, therefore, received nearly double the amount of processing without production of a materially better fabric.

Ash and fluidity values show the shorter process to be better, while alcohol-soluble material and wax values show a slight but definitely better removal in the longer process. Although shortening the process by as much as half is probably inadvisable, some decrease in the amount of processing, in view of these data, would possibly enhance the quality of the finished cloth.

SUMMARY

The methods of the research laboratory have detected differences in commercially acceptable fabrics which were not visible or detectable by the less accurate techniques of the usual control laboratory.

A comparison of a conventional kierboil with a hypochlorite bleach and a double-boil hydrogen peroxide bleach showed the latter to be only slightly the better of the two. This slight difference was shown only by fluidities in cuprammonium hydroxide, the most sensitive known method of detecting incipient degradation of cotton. Both bleach methods produced fabrics which were of excellent quality.

A comparison of the fluidity, alcohol-soluble material, wax and ash data of samples 610 and 615 reveals very little difference in the two, although the former had received nearly twice the processing of the latter. This, at least, suggests the possibility that the kierboil of the conventional hypochlorite bleach process could be materially shortened.

In respect to chemical degradation, the hypochlorite bleaching has been found to be the most harmful treatment the fabric received and the combined action of the water mangle and dry cans damaged the fabric almost as much as the kierboil.

Appreciation is expressed to the Colloidal Properties Section, Cotton Fiber Research Division of the Southern Regional Research Laboratory, for the fluidity determinations here reported, and to Miss Claire Lesslie of the Analytical, Physical Chemical, and Physical Division of the Southern Regional Research Laboratory, for the ash and ash alkalinity determinations.

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TABLE III. Comparison of the properties of a broadcloth after 12-13 hours of processing with those of 7-8 hours of processing

	12-13 hrs. processing Sample 610	*7-8 hrs. processing Sample 615*
Shrinkage (fabric relaxed)	6.54 %	7.21%
Warp breaking strength (Adj.)	80.0 lb.	77.1 lb.
Filling breaking strength (Adj.)	39.2 lb.	32.8 lb.
Thickness	.0132 in.	.0125 in.
Ounces per square yard	3.80	3.79
Whiteness	.7346	.7195
Yellowness	.0854	.0929
Alcohol-soluble material	.37%	.44%
Wax	.34%	.49%
Ash	.10%	.04%
Fluidity	2.68 rhe	2.50 rhe

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Water Repellent Clothing–

(*Continued from Page* 272)

penetration, but most of the results are uncertain. Factors yet unknown cause treatments to be non-replicable. Doubtless it will be necessary to submit wool to some pretreatment prior to application of repellents to assure consistent results. At present, a water-repellent treatment is not believed to be sufficiently advantageous to make it a requirement.

Synthetic fabrics have not been used extensively for Army clothing. Considerable development was done to ascertain the possibilities for their use, however, and the water-repellency aspects were considered. To date, the Army has not found a repellent finish satisfactory for its synthetic fabrics although considerable success has been attained in making so-called water-impermeable water - vapor - permeable fabrics from this kind of material wherein a finish approaching a continuous film is utilized.

Fabric Pieces, Kept Soaked by the Rainfall which is Falling on the Entire Course, Simulating Action of Wet Tree Boughs and Vines on the Upper Portion of the Garments.
The man enters the far side of this advice while in a standing position but is gradually forced to assume a crawling position before he emerges from this side of it.

B. Fabric Construction and Garment Design

The present American version of the best way to take advantage of the Shirley fabric principle of extremely small interstices is to apply the best durable water repellent finish with the objective of obtaining the greatest hydrophobic surface possible. This type of densely woven, highly hydrophobic fabric is quite resistant to the passage of water. After long exposure it undergoes a gradual wetting of the outer portion at a sufficiently slow rate to permit swelling of the yarns, thus utilizing the swelling effect possibly before any water actually penetrates. The repellent remains sufficiently effective to retard satisfactorily the passage of water by other mechanisms. This theory has been substantiated in Wet Course tests comparing the earlier sateen-poplin jackets with the Oxford-Oxford jackets. These tests, made with the men walking in a 3-in-per-hour rainfall, for continuous test periods, have shown:

a. Fairly new jackets—a substantial percentage of Oxford-Oxord jackets will keep men dry for more than 8 hours. The sateen-poplin jackets will do almost as well.
b. Jackets approximately half expended by wear (tested while soiled)—the Oxford-Oxford jackets averaged 110 minutes and the sateen-poplin jackets average 44 minutes protection.
c. The same garments tested in "b", laundered and again tested.—the Oxford-Oxford jackets averaged longer than 4 hours' and the sateen-poplin averaged a little longer than 3 hours' protection.

On the other hand, under the same conditions, with the men walking in 3-inches-per-hour rainfall, single-layer field trousers gave the following performance:

a. Fairly new field trousers—both Oxford and sateen gave protection averaging longer than 4 hours.
b. Field trousers approximately half expended by wear (tested while soiled)—protection for Oxford averaged 54 minutes and for sateen averaged 21 minutes.
c. The same garments tested in "b", laundered and again tested—protection for Oxford averaged 77 minutes and for sateen averaged 41 minutes.

These findings have led to the adoption of the 9-ounce wind-resistant Oxford to replace 9-ounce wind-resistant sateen in rain-protectant garments. It is believed that the other types of wind-resistant Oxford fabrics will eventually replace several of the other fabrics now used.

The necessity for eliminating seams has been recognized for many months, as they will go far to nullify the water-repellent effect of the best finish and the best fabric. Horizontal seams are particularly to be avoided as they catch the downward flow of water and permit its wicking through. The row-upon-row of stitching in collars has been eliminated; outside pleats and tucks are kept to a minimum, and a belt arrangement on the inside of garments furnishes means of snugging them to the body. Exposed buttons and button-holes have been eliminated, and pockets have been redesigned to permit less water to enter. Shoulder areas are made to give maximum freedom of arm movements and garments are designed to present smooth, close-fitting layers to minimize stress on seams or fabrics during wear. The sections used in the outer and inner layers are made virtually as two separate garments to avoid continuous seams from the outside through the inner fabric.

Two-layer hoods of the same material as the jacket provide good protection to the head and prevent water from entering around the collar area—which was a common failing before the adoption of the hood.

It is believed that trousers made entirely of a single-layer cotton fabric will keep men dry sufficiently long to be of value for curtailed activities but are not nearly so suitable as the two-layer jackets. The primary failure is in the front part of the knee area, because of excessive wet mechanical action and because the trousers also receive the water which runs off the upper garments. Experimental Arctic fatigue suits with trousers made of two layers of 9-ounce Oxford have given good protection for continuous wear under wet-cold conditions. Such constructions are cumbersome, however, and have limited usefulness.

Work is still in progress to determine the critical physical limits and characteristics of wool fabrics for optimum water resistance; it is not improbable that the construction of many wool fabrics will permit water absorption and transmission, no matter if the perfect repellent is applied, because of the size, shape and distribution of the innumerable interstices.

Test Subjects Going Between Narrow Brick Walls. The man at the right is just entering and the man on the left is just emerging through an opening corresponding to a window.

C. Servicing Procedures

Army regulations require that all cotton water-repellent garments be laundered, rather than dry-cleaned, except for those few items in which appearance is more important than performance. Whether laundered or dry-cleaned, all repellent-type garments are required to be re-treated with a water repellent approved and furnished by the Quartermaster Corps. Pressing is advantageous, particularly from the standpoint of appearance, but is not necessary for good performance.

Either soap or the approved mobile laundry synthetic detergents may be used for laundering. A formula of two suds followed by a minimum of four rinses and then a 10-minute treatment with repellent (applied in the washer or by manual agitation in a tank) is considered the most effective method. No other materials appear at present to be advantageous in the process.

If dry-cleaning is done, it should be done in new solvent without soaps or spotting agents. The garments are extracted and dried in the usual manner, and then agitated in a washer (or manually in a tank) for a minimum of five minutes with a ten per cent solution of the repellent product in the dry-cleaning solvent. The drying prior to re-treatment is important. The garments are then extracted, dried, and finished in the usual manner.

Retreatment appears to be effective for two or three weeks of fairly heavy wear conditions. Re-treatment of garments originally having a durable finish extends the protective period until the fabric deterioration becomes the dominating factor.

MAJOR PROBLEMS IN WATER-REPELLENT GARMENTS

At a recent meeting of executives and technologists of the American textile industry, General Georges F. Doriot, Chief of Military Planning Division, who is responsible for directing the research and development activities of the Quartermaster Corps, stated: "Until the defeat of Japan we all felt very proud of the equipment which had been provided for the American Army. But now that V-J day has passed, we realize that little of the present Quartermaster Corps equipment will be applicable to a future war." This terse statement certainly includes the need for better protective clothing such as water-resistant garments.

It is believed that, for the present, research and development efforts should include the suggestions made below. Doubtless, as the work progresses some of these may be superseded by other lines of endeavor made necessary by changes in the fundamental concepts of national security. It is believed, though, that these suggestions are certainly pertinent to civilian requirements for a long time to come.

A. Finishes

1. Develop durable finishes suitable for cotton, wool, and synthetic fabrics which impregnate each fiber rather than form incomplete hydrophobic "shells" which deteriorate markedly under the stress of mechanical action. The finishes must be durable to both wet-cleaning and dry-cleaning.

2. Investigate the possibilities of applying finishes in the yarn state rather than to the finished fabrics, so that fabrics can be made of hydrophobic and hydrophylic yarns placed in the fabric construction for special effects.

3. Develop re-treating repellents, applicable in aqueous and solvent systems, which have sufficient durability to resist wear deterioration until the garment is cleaned again (perhaps several months), and which are, if possible, also resistant to cleaning procedures.

4. Develop re-treating repellents applicable in aqueous systems which are not stored as emulsions.

B. Fabric Construction and Garment Design

1. Undertake fundamental studies of fiber and filament characteristics so that ideal finishes can be developed to overcome inherent deficiencies in the fibers and filaments.

2. Investigate fabric structure to determinute effective constructions for water barriers which are consistent with other desirable characteristics, including such factors as quick-swelling filling yarns and water-repellent warp yarns (and possibly some of the filling yarns).

3. Determine from a physiological standpoint the lower limit for moisture vapor permeability of fabrics and garments as related to activity levels. Until this is done, no limits can be set between present water-repellent and waterproof fabrics as being the ideal compromise to accomplish optimum water vapor transmission from the body and resistance to passage of water from the exterior.

4. Develop methods for dissipating moisture vapor from the body by means other than transmission through the fabric layers.

5. Provide vents or other means of allowing water and air to be dissipated between the fabrics layers. This would facilitate more thorough washing, rinsing, re-treatment, and drying operations.

6. Eliminate all conventional-type seams by using plastic sealing or other means. In lieu of this, develop sewing thread which is both shrinkproof and waterproof.

7. Use fabric materials and fiinishes which are much more soil-resistant so that cleaning requirements are minimized.

8. Determine the advantage of the different combinations possible between presently developed water-repellent fabrics.

9. Determine the advantage of multilayer constructions other than the two-layer type now used. It is particularly desired to investigate the possibilities of using impermeable layers to supplement repellent fabrics in critical areas, such as around the shoulders, knees, etc.

10. Determine the possibilities of using an underneath layer of resilient water-repellent material.

11. Determine fabric construction limitations for combined requirements of thermal resistance and water repellency from such standpoints as total free space, shape and size of interstices, continuous and noncontinuous interstices, resiliency, and air permeability. Such

Subjecting the Garments to Crawling over a Flat, Wet Surface

studies might point out the necessity of redesigning wool fabrics and would serve also as a fundamnetal guide in "blueprinting" new fabric constructions.

12. Develop more efficient garment closures.

13. Make pockets more fool-proof against catching and retaining water.

C. Servicing Procedures

1. Develop dry-cleaning products and procedures which will not deteriorate or nullify water-repellent finishes.

2. Develop aqueous detergents, and processes for using them, more suitable for maintaining the proper finish.

3. Develop better methods of applying both aqueous and solvent re-treating repellents to garments.

APPENDIX

Army Fabrics Requiring a Durable Water-Repellent Finish

Type I twill (Byrd cloth)
U. S. Army Specification No. 6-321A, *Cloth, Cotton, Wind Resistant*

Type II 5-ounce poplin
U. S. Army Specification No. 6-321A, *Cloth, Cotton, Wind Resistant*

9-ounce sateen
U. S. Army Specification No. 6-337, *Cloth, Cotton, Wind Resistant, Sateen 9-ounce*

8.2-ounce twill
U. S. Army Specification No. 6-201B, *Cloth, Cotton, Twill, Uniform, 8.2 ounce*

Type I 6.5-ounce wind-resistant Oxford
Quartermaster Corps Tentative Specification PQD No. 444, *Cloth, Cotton, Wind Resistant, Oxford, O.D., Water Repellent*

Type II 7-ounce wind resistant Oxford
Quartermaster Corps Tentative Specification PQD No. 444, *Cloth, Cotton, Wind Resistant, Oxford, O.D., Water Repellent*

Type III 8-ounce wind resistant Oxford
Quartermaster Corps Tentative Specification PQD No. 444, *Cloth, Cotton, Wind Resistant, Oxford, O.D., Water Repellent*

Type IV 9-ounce wind resistant Oxford
Quartermaster Corps Specification PQD No. 444, *Cloth, Cotton, Wind Resistant, Oxford, O.D., Water Repellent*

Type V 8.5-ounce wind resistant Oxford
Quartermaster Corps Tentative Specification PQD No. 444, *Cloth, Cotton Wind Resistant, Oxford, O.D., Water Repellent*

—♦ ♦—

Antiperspirant Creams–

(*Continued from Page* 271)

tion will be distributed so as to give nearly uniform results.

8. After pressing, the strips shall be conditioned at 80° F. and 85 per cent relative humidity for 3 hours.

9. Before the last conditioning period, the strips shall be cut up into 6″ x 4″ pieces—rejecting ½″ at each end. The 1 inch strip to which the sample was applied will then run across the middle of these pieces from one long edge to the other. A pencil mark shall be made 1½″ from one of the 6″ edges and along a single continuous thread. This is to serve as a guide for the application of the jaws of the testing machine. At the end of the 3 hour conditioning period the strips shall be broken by the grab test using 1 inch jaws in a motor-driven tensile strength machine—preferably the Suter machine.

10. A decrease of tensile strength, under the conditions of this test, up to 20 per cent is allowable provided that the number of breaks showing a reduction in tensile strength over 20 per cent does not exceed 5 out of a total of 25.

Appendix B

PRACTICAL USE PROCEDURE FOR DETERMINING POSSIBLE FABRIC DESTRUCTION BY CREAM TYPE ANTIPERSPIRANTS

1. A group of at least 20 women shall be used, and should include light, heavy and normal perspirers.

2. Forty-eight hours before the start of the investigation, the underarms of the testing group shall be shaved, and they shall be instructed to use *no* antiperspirant of any kind until the start of the investigation.

3. The creams under investigation shall be applied by an expert operator, strictly in accordance with the individual manufacturer's directions, after the underarm has been washed and carefully dried.

4. Pieces of cotton test fabric, 4 x 6 inches in size shall be pinned into the dress of each subject by the operator. These shields shall be marked "Right" and "Left" and shall also carry some mark identifying them to the individual subject.

5. These shields shall be worn during the length of the business day. At the end of the day they shall be removed, and each set placed in an envelope marked with the wearer's name or code number.

6. The application of the cream shall be repeated for the two following days, making a total of three days in all. The shields shall be replaced each morning, and removed each night as described above.

7. On the morning of the fourth day the shields, together with unworn controls, shall be pressed for 10 seconds in an electric ironer with the thermostats set for 375° F. Any loss in tensile strength in the worn shields is then determined against the unworn controls. A properly formulated and buffered cream should not cause a reduction of more than 10 per cent under the conditions of this test.

8. If the results of this investigation are in doubt, it shall be repeated using a second group of at least 20 subjects.

DISCUSSION

Mr. deNavarre: Miss Bien, you mentioned the effect of humectants earlier in your paper. Did you find any correlation between the different types of humectants?

Miss Bien: I don't believe so. We have had products which have had propylene glycol and others which have had products like "arlex" or sorbitol, and the effect on fabrics seems to be very similar in all those cases.

Mr. Dobie: Will you state again your definition of per cent damage? You spoke of 35 per cent fabric damage, etc. What is your definition of per cent damage? When you say 35 per cent damage, what do you mean?

Miss Bien: It is simply the calculation of the reduction in tensile strength against the control.

Dr. Lauffer: Miss Bien, did you arrive at any conclusions as to the critical acidity which any of those fabrics would stand—that is, the acidity at which they would begin to be damaged?

Miss Bien: pH is, of course, an extremely important factor. It is not, however, a factor by itself. In other words, you may have a cream at a pH of 2.95 which will give satisfactory results under the conditions of this investigation, and you may have another at 3.25 which gives bad damage. In other words, it is a question of holding together your emulsion and the balance of your basic ingredients with your aluminum salts and your buffer, rather than pH per se which is the critical factor.

I would say, however, that if you went under pH 2.5 you would probably not have much luck—no matter how else you balanced your formula.

Mr. deNavarre: You mentioned the word "buffer." Do you think that these compounds used to prevent the destructive effect of the aluminum salts are truly buffers? Do you think "buffer" is a name we have applied to them and some other name might be more aptly applied?

Miss Bien: I think you are probably right. I doubt whether the action is basically a truly buffering one. It is probably more concerned with the release of an alkaline ion under conditions of raised temperature than an actual buffering action.

TRADE NOTES • NEW PRODUCTS

• DEXTER REPRINTS

The Textile Chemical Division of the Dexter Chemical Corporation has issued the second in a series of reprints by its Technical Director, Sidney M. Edelstein, a recognized authority on the mercerization process. The booklet entitled, "A Study of the Mercerization Process," is divided into three parts:

1—The Effect of the Mercerizing Caustic Soda Concentration.

2—The Effect of Tension.

3—The Effect of Caustic Temperature.

Copies are available by writing to the Dexter Chemical Corporation, 819 Edgewater Road, New York 59, N. Y.

• STAMP RECONSTRUCTION

Recently an Ultramarine and Dyestuff representative of the Calco Chemical Division, American Cyanamid Company, Bound Brook, New Jersey, while on a business trip in South America, acquired one of the most rare Brazilian stamps, the black 600 unused of the Inclinado Empire Series, issued in 1844-1846. This stamp had been purchased from a Chilean dealer and was from the Alessandri Collection in Santiago, Chile.

In showing this stamp to a New York dealer, it was questioned whether the stamp had been reconstructed in one corner because when put into benzene this corner appeared different from the others. Careful examination under the microscope by various methods of illumination including ultraviolet light, could not show this corner to be different. Paper fibers ran directly from the center of the stamp into the questioned corner, making a repair quite improbable. However, the most convincing observation to prove the authenticity of the stamp oddly enough came back to Ultramarine Blue Pigment. The microscope at high magnification revealed a clear and rather large size transparent blue pigment throughout the paper, both in the body of the stamp and in the questioned corner. It is probable that the paper on which the stamp was printed was of French origin and that the Ultramarine had been added to "whiten" the paper. The corner which had failed to "wet out" in the benzene was probably caused by a hard spot produced by the reaction of some chemical dropped upon the paper or due to some mechanical difference in the construction of the original paper. Thus, the Ultramarine pigment put in by the artisan years ago made it possible to establish the identity of very small portions of his paper today.

• PALMALENE AVAILABLE

The Beacon Company, manufacturers of chemicals, announce the commercial availability of Palmalene, a synthetically made product. Palmalene's specifications, which include a saponification number of 180-185, iodine value of 55-60 and titre of 30, make it suitable for many uses. It is said to be of especial interest for textile specialties, soap making, alkyl resins, polishes, wetting agents, cosmetics, rubber compounding, kier assistants, driers, and pulp and paper manufacture. Data sheet and price schedule may be obtained by writing the Beacon Company, 97 Bickford Street, Boston, Massachusetts.

• WOOL DYEING ASSISTANT

A combination detergent, levelling agent and protective agent has been developed by the Textile Chemical Division of the Dexter Chemical Corporation for use in the dyeing of wool, wool unions of cotton and rayon, and loose fur. Introduced as Telkanol O Solution, it is stated that this product can be applied advantageously for a multitude of purposes in dyeing.

Distinguished by stability toward all kinds of chemicals occurring in the processing of wool, including boiling acid liquors, it is said to be unaffected by the hardness of water, acids, alkalis, or salts and may be used for machine dyeing.

It is said to have a strong dispersing effect upon oil, grease, or other impurities retaining within the goods and upon all kinds of fats in the acid liquors. It is claimed that by boiling in the machine for about 20 minutes 1.5-8% Telkanol O Solution and 2% acetic acid 30% (9° Tw.), followed by a thorough rinsing, wool waste with a high grease or mineral oil content can be degreased to such an extent that no difficulties will arise in the subsequent dyeing. It thereby is said to help to avoid damage liable to be caused by such residues and to provide a safe basis for good fastness to rubbing in dark dyeings. These effects of the auxiliary can be utilized in the preliminary treatment, the actual dyeing, and the after treatment.

It is used for the dissolving and dyeing of the dyestuffs which, because of limited solubility, give trouble in levelling and is recommended in acid dyebaths, afterchroming or monochrome dyestuffs. It is stated that small additions of the product in the dyebath (as little as ½-1½% Telkanol O Solution) will be found very serviceable as a levelling agent and auxiliary to obtain better fastness to rubbing and a more even dyeing of clearer shade. In the case of wool mixtures of different dyeing behavior, its presence is said to increase the levelling. It is claimed that if any risk of floating or foaming appears in materials of very fine yarns, the auxiliary of the product, only when the temperature

of the bath has reached the boiling point. is added without detriment to the efficacy precipitations of direct dyestuffs sensitive to lime. In dyeings with ammonium sulfate for a strong dyeing of the wool, the product is said to prevent a precipitation of the cotton dyestuffs.

The same effects are said to be obtained in the dyeing of loose fur. Precipitations of the dyestuff frequently due to carroting are said to be prevented by the addition of Telkanol O Solution to the dyebath.

• BUFFALO OFFICE, CARBIDE & CARBON

The Buffalo district office of Carbide and Carbon Chemicals Corporation has been moved to the Liberty Bank Building at 424 Main Street, according to an announcement by Company officials. Mr. R. C. Boltz is in charge of the Buffalo District.

• FORUM ON TEXTILE RESEARCH

The latest results of textile research which has developed many new raw materials from which fabrics can be made and new uses to which they can be put were discussed on the Rutgers University Forum May 13th.

The forum question, "What's Ahead in Textiles?" was answered by Dr. Harold DeWitt Smith, textile technologist; Miss Cora Smith, director of the Bureau of Standards, Bamberger's Store, Newark; William F. Morgan, textile engineer of the U. S. Testing Company, Hoboken; and Miss Inez LaBossier, clothing specialist of the Extension Service, Rutgers College of Agriculture.

They discussed new synthetic fabrics, new discoveries in waterproofing, fadeproofing, fireproofing and mothproofing of materials, and the present status of the textile supply.

The roundtable discussion was broadcast by Station WAAT, Newark, from 8.30 to 9:00 P.M. Marshall G. Rothen, director of broadcasting, was the moderator.

• MERCERIZING BOOKLET BY HART

A 12-page booklet entitled "Mercerizing and Alkamerce—The Ideal Dry Mercerizing Penetrant" is off the press and ready for distribution according to an announcement by The Hart Products Corporation, 1440 Broadway, New York City, Manufacturing Chemists.

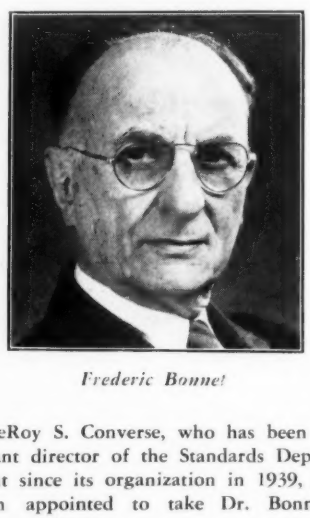
"Mercerizing and Alkamerce" describes in detail the methods of mercerizing and gives instructions for the recovery of caustic soda when using Alkamerce in the process. Seven important factors in mercerizing—from strength of the caustic soda solution to the drying operation—are covered.

Enumerating eight advantages in the use of Alkamerce, the booklet shows how it makes possible "Dry Mercerizing"—the elimination of all preparation of the yarn such as boiling-out or wetting-out.

Complete instructions for use of Alkamerce as a mercerizing penetrant are included. An interesting table shows the results of comparative wetting tests of Alkamerce with six other mercerizing penetrants on the market. A request on company letterhead will bring your copy.

• DR. BONNET RETIRES

Dr. Frederic Bonnet has retired as director of American Viscose Corporation's Standards Department at Marcus Hook, Pa., but will continue to serve the company as adviser to William C. Appleton, president, it has been announced. He will also continue his work in connection with a number of activities that he has been handling over and above the management of his department and will be available to take care of special assignments.



Frederic Bonnet

LeRoy S. Converse, who has been assistant director of the Standards Department since its organization in 1939, has been appointed to take Dr. Bonnet's place as director.

For the present, Dr. Bonnet will continue as chairman of the "Crown" Treated Advisory Group, and will continue to represent American Viscose Corporation on technical societies and committees and give talks and technical papers, as he has done in the past.

Dr. Bonnet joined American Viscose Corporation in October, 1925, as head of the Service Department, the functions of which were to assist and guide the company's customers in the handling and processing of rayon. When the company organized its Textile Research Department in 1939, this department took over the customer contact work formerly done by the Service Department. The name of Dr. Bonnet's department was changed to Standards Department, and the nature of its work was altered, its duties including the standardizing of testing procedures for the company's rayon and cooperation with the seven plant control laboratories to make certain that the prescribed quality standards are maintained. The department also conducts research on textile fibers, yarns and fabrics as part of the company's broad, long-range research program to improve rayon and rayon products.

Dr. Bonnet is a graduate of Washington University, St. Louis, Mo., with a B.S. *cum laude* in chemistry. He also holds an M.S. and a Ph.D. degree from the Harvard Graduate School.

After leaving the Harvard Graduate School he was instructor in chemistry at the medical school of Iowa State University, Iowa City, Iowa, and then joined the Worcester Polytechnic Institute as assistant professor of chemistry, later becoming a full professor.

Shortly after the outbreak of World War I, Dr. Bonnet was appointed chief chemist of the U. S. government ammonium nitrate plant at Perryville, Md., which was operated by the Atlas Powder Co. Following the war he became head of Atlas Powder Company's new experimental laboratory, and continued in that position until he joined American Viscose Corporation in 1925. During this period he went to Germany with LeRoy S. Converse, his successor as director of American Viscose Corporation's Standards Department, and operated a rayon plant at Petersdorf, Germany, for three months.

Dr. Bonnet is a director of the Textile Research Institute, a fellow of the American Association for the Advancement of Science, a member of the scientific society Sigma Xi, a member of the A.A.T.C.C. and functions on its research committee, and a member of the American Chemical Society.

• CALCO RESEARCH PERSONNEL

The Calco Chemical Division, American Cyanamid Company announces the establishment of positions designed to give due recognition to the professional accomplishments of its research personnel and to afford the widest opportunity for their scientific services.

The first phase of Calco's progressive program was instituted in January 1944 by establishment of the position of Research Associate to recognize high scientific attainments and wide experience in both the prosecution and direction of the research of the Company. Research Associates are relieved of the responsibilities for detailed administration of a regular unit of research in order to be available for important special assignments in the Research Department. They must

Dr. Dale R. Eberhart who has been appointed Research Fellow of the Calco Chemical Division, American Cyanamid Company. Dr. Eberhart received his Doctor of Philosophy degree from the Ohio State University in 1935 and has been associated with Calco since that time.

have had not less than twenty years of professional experience since receiving the Doctor of Philosophy degree or its equivalent, and must have been in the employ of the Company not less than ten years, five of which were spent in directing or supervising the research work of others. The position is comparable with an executive position in research requiring similar experience and entailing equivalent responsibilities.

A second phase of Calco's program is now completed by establishment of the position of Research Fellow to recognize outstanding ability for individual research. The position affords the opportunity for properly qualified scientific personnel to concentrate on research without the handicaps imposed by supervisory responsibilities. Research Fellows must have had not less than ten years of professional experience since receiving the Doctor of Philosophy degree, or fifteen years of professional experience since obtaining the Bachelor's degree, and must have completed five years of continuous service in research with the Company. The position is comparable with a supervisory position in research requiring similar experience and attainments.

• LEAVE FOR SCIENTISTS

Inauguration of an academic leave for industrial scientists at Monsanto Chemical Company to enable them to return to universities of their choice for an academic year of study at full salary, has been announced by Dr. Carroll A. Hochwalt of Dayton, Ohio, Monsanto's Director of Central Research.

Addressing the National Industrial Conference Board, Dr. Hochwalt said the leave of absence was established by Monsanto's Executive Committee to encourage the scientific work and development of technical personnel in physics, chemistry and chemical engineering. Four leaves will be granted each year, he added, and will be made on the basis of especially meritorious services and outstanding performance in scientific work carried out at any period and in any location in the service of Monsanto.

• NEW pH METER

Pfaltz & Bauer, Inc., Empire State Bldg., New York, N. Y. are currently offering an inexpensive new type continuous-indicating direct-reading pH meter which eliminates the need of dry cell batteries as it is completely line-operated. Being line-operated this pH meter can be left on continuously as the current consumption is extremely low. The accuracy of the new line-operated pH meter is .1 pH, and its sensitivity is .05 pH.

It is stated that a direct-reading feature of this instrument eliminates time-taking and other bothersome adjustments and that frequent buffer standardizations are also eliminated. The instrument is small and compact in a metal housing and has a large easily read scale graduated to 1/10th pH. May be used in connection with a variety of electrodes. Simple instructions accompany each instrument so that the untrained user can easily make ordinary pH measurements.

• PRESIDENT OF DEANS

Dean Malcolm E. Campbell, head of the School of Textiles at N. C. State College, was elected president of the National Council of Textile School Deans at the organization's recent semi-annual conference at Princeton University. Dean Campbell joined the State College faculty in September of 1943 following a tenure with the Textile Research Institute.

• NUODEX FUNGICIDES

A line of fungicide concentrates to meet every mildew or rot proofing need has been announced by the Nuodex Products Co., Inc., 581 Magnolia Avenue, Elizabeth F, N. J., manufacturers of driers and other chemical specialties. These new fungicides are a direct result of extensive research activity to supplement the metallic naphthenates of which Nuodex is a leading producer.

Marketed under the tradename "Nuocides," these fungicides, for ease and safety of handling, are solutions or liquid emulsion bases designed for controlling mildew or rot in processes in the textile, lumber, plant, cordage and other industries, and in the finished products they produce.

Nuocide mildewproofing agents are said to represent marked improvements in the control of mildew. Their use is claimed to prevent mold damage and improve product performance and saleability.

Recognizing that various problems presented specific rotproofing and mildewproofing requirements, care has been exercised to produce a series of varied types of fungicides which will adequately meet all situations encountered.

The complete Nuocide line includes both solvent and water soluble types. It includes materials which are "microbiostatic" in that they arrest or inhibit microbial growth; and others which are "microbiocidal," in that they destroy the microorganisms.

Dr. Robert P. Parker, who has been appointed Assistant to the Research Director of the Calco Chemical Division, American Cyanamid Company.

Dr. Parker received his doctorate from Yale University in 1933 and has been associated with Calco since that time. For the past two years, he has been an Assistant Director of the Organic Section of the Research Department.

• RETURN TO VISCOSE

Eleven members of American Viscose Corporation's New York office staff, who have been on military leave, have recently been released from the services and have returned to the company.

They are Robert H. Anderson of the credit department; Sidney Creveling, Thomas J. Desmond and William J. Keefe of the viscose rayon yarn sales division; F. Douglas Cudlipp of the advertising department; Richard W. Nelson of the printing department; William Niederreuther and Thomas Price of the export department; Chauncey O. Page of the job analysis department; John W. Sheppard IV of the "Crown" Tested department; and George W. Waiting of the statistical department. In addition, John C. Folsom, Stanley G. Haskins and Cyril Sumner, Jr., have returned to the sales office at Providence, R. I.

• WARTIME ADVANCES IN CONTINUOUS BLEACHING

In a recent statement on the war-time progress in equipment for continuous bleaching, DeHaven Butterworth, vice-president, H. W. Butterworth & Sons Company, said:

"There was reason to be thankful for

Leonard Shapiro who has been appointed Textile Research Director of Alrose Chemical Company. Mr. Shapiro will take charge of research on the company's numerous textile processes, particularly the Definized process for stabilization of rayon, wool or mixed fabrics.

Mr. Shapiro is well-known to the textile industry, and was formerly Director of Textile Research at Warwick Chemical Co., where his work included research and development on all types of textile auxiliaries and finishes. Prior to his connection with Warwick, Mr. Shapiro was affiliated for nearly seven years with the coated fabrics industry as Director of Laboratories and Research at Interlaken Mills.

Mr. Shapiro was graduated from Massachusetts Institute of Technology in 1934 and remained on the staff as Research Assistant to Prof. E. R. Schwarz until 1936 when he received his Master's degree.

continuous bleaching under the war-time pressure for tremendous yardages of goods. The makers of one bleaching process estimate that 1,300 million yards of cloth were bleached by their process during the war years. While economy was no real objective, continuous bleaching proved to be vastly more economical than kier bleaching on big production. This saving was not only in chemicals, but also in time and labor.

"Of course, there are practical minimums for continuous bleaching. One mill with a production of 400,000 yards per week based on a 24-hour day used continuous bleaching successfully by installing a single "J"-box system. There is a slight increase in chemical costs with the single "J" because all the caustic soda must be removed from the saturator before the peroxide is put in. There is also extra time involved in loading the "J"-box.

"There have been many improvements in the "J"-box. It is now made of heavy gauge stainless steel with a 4-B mirror finish, a much stronger unit. There is no deformation or bulging under great pressures. Full-rounded corners remove the catch-pockets that formerly were such a problem. We have succeeded in eliminating the waviness in the bottom of the "J"-box so that goods can be fed safely and easily from the bottom of the "J."

"A new horizontal six-roll washer, using air pressure to compress the rolls, was developed during the war. In tests, this washer has proved just as effective as the conventional 4-box washer in washing out alkalinity. The vertical washer being used just before the war in several mills used less floor space and was easier to thread up than the horizontal washer, but we have discontinued making the vertical washer until natural rubber is available again.

"The speed of the continuous bleaching method has been steadily increasing, until today heavy goods (150's and 185's) can be handled at about 75 yards per minute. Two-and-one-half yard goods can travel at 100 yards per minute. Five yard goods can be processed at speeds up to 200 yards per minute."

The quality of continuous bleaching is now equal to that of the old kier-boiling method, Mr. Butterworth claimed.

"At the present time," Mr. Butterworth continued, "we are working on a new all-purpose machine on which heavy goods (150's and 185's) go through the "J"-box in rope form and through the washing operation in open form. This will be the first time that "heavies" have been handled in this manner.

"The goods are saturated in the open width. They go into the "J"-box in rope form and are opened on a scutcher as they leave the "J." Then, the goods are washed in open width. The process is repeated for the peroxide—saturated in open width, back into rope form into the "J"-box, then through another scutcher to open it for the final washing.

"Heretofore, it was never possible to prepare goods satisfactorily without injuring it in the final washing process and most of the goods were scoured on the progressive boil-off machine in the open width, which involved quite a labor cost. Every time you wound a roll you had to thread the end on to the next beam. Now goods run continuously through the bleaching range at a very low labor cost and every yard of goods is prepared uniformly. The danger of loading the kier improperly, which would cause channeling of the liquor and give unevenness in the preparation of the goods, has also been eliminated.

"The only change made in the bleaching range in order to handle rope and open width on the same range is in the washers. Both caustic and peroxide saturators carry the goods in open width."

● du PONT APPOINTMENT

Hood Worthington, who has been on assignment for the last three years at the Hanford Engineer Works, which the Du Pont Company operates for the government, has been appointed assistant director of the recently organized engineering research section, Rayon Technical Division.

Howard I. Belton who has been appointed manager of the Boston office of American Aniline Products, Inc. Mr. Belton, who is 42 years old, is a graduate of the high school of Mt. Airy, North Carolina, and of the Sparger School where he majored in business administration. He also attended Trinity and Yale University and is a member of the A.A.T.C.C., the Elks and the Shrine.

A chemical engineer, Mr. Worthington received his bachelor of science degree at Massachusetts Institute of Technology in 1924 and his master's degree in 1925. His industrial experience, dealing largely with development of equipment in new fields of chemical manufacture, has been entirely with the Du Pont Company.

As a member of the Chemical Department until 1935, Mr. Worthington was active in equipment design and testing in the field of high-pressure chemical synthesis. Transferred to the Engineering Department in 1935, he contributed importantly to the development of the original processing equipment for nylon. He became a supervisor in the nylon research section shortly after his transfer to the Rayon Technical Division in 1938.

OBITUARY

GERARD B. CLORAN

GERARD B. CLORAN, Manager of the Advertising and Sales Promotion Department of National Starch Products, Inc., 270 Madison Avenue, New York, N. Y., died April 28, at the age of 38, after a short illness.

Mr. Cloran had been connected with the organization for thirteen years. He was a member of the Direct Mail Advertising Association and served on many industry committees including the Packaging Council of the American Management Association and the Adhesives Manufacturers Association of America.

He contributed numerous articles to trade magazines on various aspects of sales promotion and on uses of adhesives.

Surviving are his wife, his parents, and a brother.

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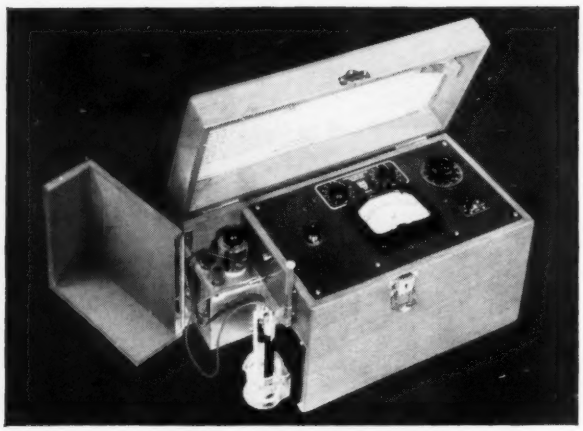

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Further details are in Catalog E-96 (2), sent on request.

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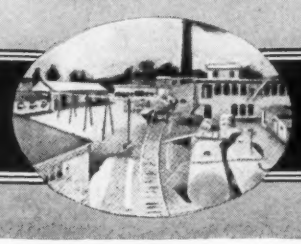

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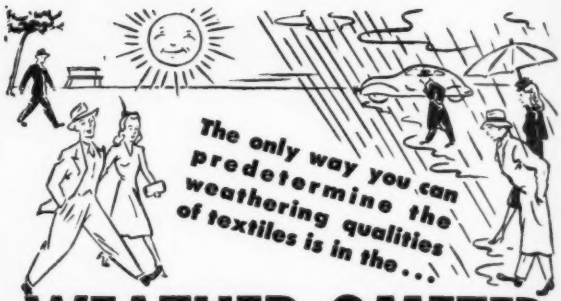

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(with apologies to Alice in Wonderland)

"Do you suppose," the Walrus said,
"That they can get it clear?"

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INDEX TO ADVERTISERS

Alrose Chemical Co.
Althouse Chemical Co.
Amalgamated Chemical Corp.
American Aniline Products, Inc. XIX
American Cyanamid & Chemical Corp. Second Cover
American Dyewood Company XXXV
American Viscose Corp.
Ansul Chemical Company
Aqua-Sec Corp.
Aridye Corp.
Arkansas Company, Inc. XXXIV
Arnold, Hoffman & Co., Inc. XIII
Atlantic Chemical Co.
Atlas Electric Devices Co. XXX

Becco Sales Corp.
Bick & Co., Inc.
Blickman Co., S. XXXI
Borne Scrymser Co.
Burkart-Schier Chemical Co. XXXV
Butterworth Sons Co., H. W.

Calco Chemical Division, American Cyanamid Co.
Calgon, Inc.
Campbell & Co., Inc., John
Carbic Color & Chemical Co., Inc. XXIV
Carbide & Carbon Chemicals Corp.
Carbomatic Corp.
Ciba Company, Inc. III
Colgate-Palmolive-Peet Co. XVIII
Commonwealth Color & Chemical Co.

Drew & Co., E. F.
DuPont de Nemours & Co., E. I.
Dyestuffs Division
Fine Chemicals Div.
Electro Metallurgical Co. XXI
Emery Industries, Inc.
Exact Weight Scale Co.

Fancourt & Co., W. F.

Gardinol Corp.
Geigy Company, Inc. Front Cover
General Chemical Co.
General Dyestuff Corp. IX
Givaudan-Delawanna, Inc. XXIX
Glycerine Producers Association XXII

Hart Products Corp.
Hercules Powder Co.
Hooker Electrochemical Co. IV
Houghton & Co., E. F.

Industrial Rayon Corp.
International Salt Co., Inc.

Johnson & Son, Inc., S. C. XXVI

Kali Manufacturing Co.
Kearny Mfg. Co. XXVIII
Kelco Co. XVI

Laurel Soap Mfg. Co., Inc.
Leatex Chemical Co. XXXV
Leeds & Northrup Co. XXVIII

Macbeth Corp.
Maher Color & Chemical Co.
Mathieson Alkali Works, Inc.
Monsanto Chemical Co. XXIII

National Aniline Division, Allied Chemical & Dye Corp. XI
National Carbon Co. XV
National Milling & Chemical Co. XXXIII
National Oil Products Co.
National Starch Products, Inc.
Naylee Chemical Co.
Nuodex Products Co., Inc. XXXIII
Nyanza Color & Chemical Co.

Onyx Oil & Chemical Co. VIII

Pabst Sales Company
Perkins & Sons, Inc., B. F. VI
Philadelphia Quartz Co.
Procter & Gamble

Refined Products Co. V
Richmond Oil, Soap & Chemical Co., Inc. XXVIII, XXXIII
Riverside & Dan River Cotton Mills, Inc. XIV
Rohm & Haas Co. XXXVI
Royce Chemical Co. Back Cover
Rumford Chemical Works

Sandoz Chemical Works XXVII
Scholler Bros., Inc.
Sherwin-Williams Co. Third Cover
Smith-Drum & Co.
Socony-Vacuum Oil Co., Inc.
Solvay Sales Corp. XXXI
Sonneborn Sons, Inc., L.
Standard Brands, Inc.
Standard Chemical Products, Inc.
Stein, Hall & Co., Inc.
Tennessee Eastman Corp. XVII
Ultra Chemical Works VII
Union Carbide & Carbon Corp. XV, XXI

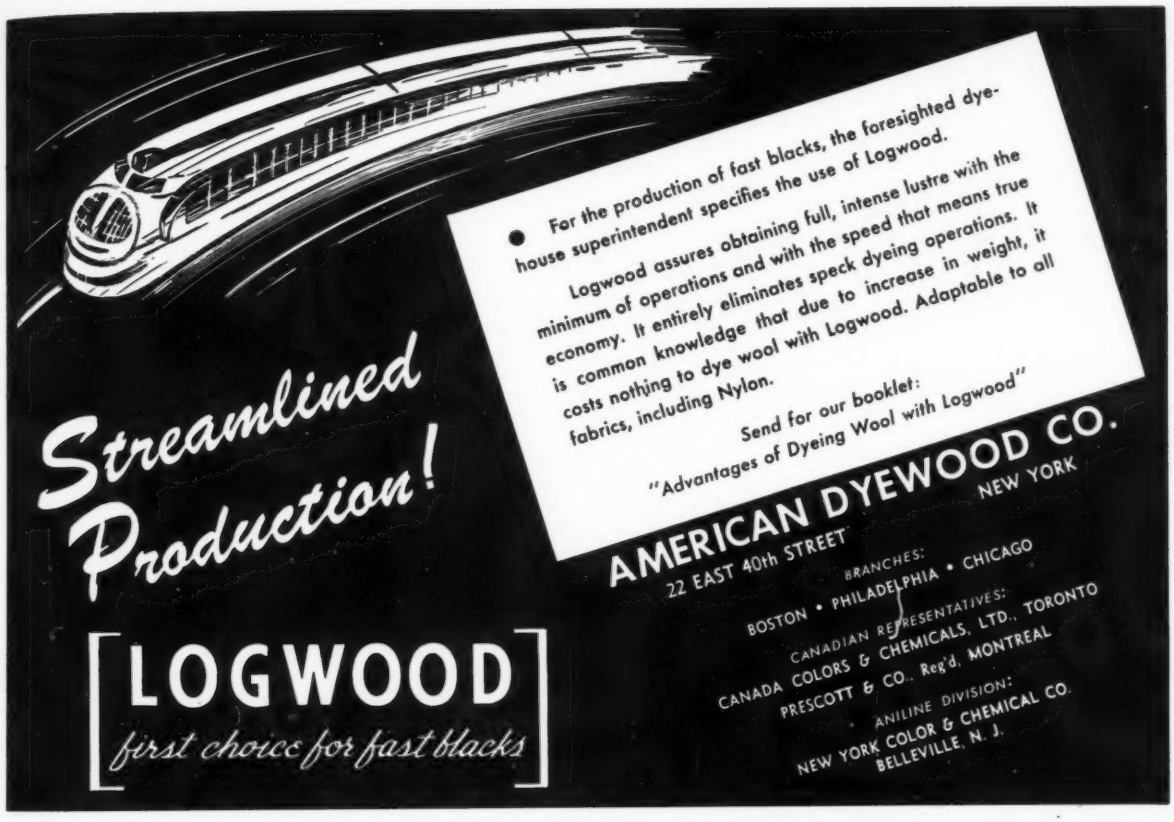
Van Vlaanderen Machine Co.
Virginia Smelting Co. XXXII

Wallerstein Co., Inc. XXX
Watson-Park Company XXIX
Wolf & Co., Jacques

Young Aniline Works
Young Co., J. S.

Zinsser & Co., Inc. XXX
Zurn Co., O. F.

ERS
XIX
nd Cover
XXXV
XXXIV
XIII
XXX
XXXI
XXXV
XXIV
III
XVIII
XXI
nt Cover
IX
XXIX
XXII
IV
XXVI
XXVIII
XVI
XXXV
XXVIII
XXIII
XI
XV
XXXIII
XXXIII
VIII
VI
V
XXXIII
XIV
XXXVI
ck Cover
XXVII
d Cover
XXXI
XVII
VII
XV, XXI
XXXII
XXX
XXIX
XXX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